June 2009

Part V
Safe Drinking Water Act
R.S.O. 2002

Sample Application Package for

Approval of a Municipal Drinking-Water System

PIBS 6842e

Protecting our environment. Ontario

FOREWORD

This document has been produced by the Environmental Assessment and Approvals Branch as an example of a complete application submission for an Approval for a Municipal Drinking-Water Distribution System for a residential development. While every attempt has been made to ensure the accuracy of the information contained in this document, it should not be construed as legal advice.

The following forms have been used in this sample application package:

- Application for Approval Related to Municipal and Non-Municipal Drinking-Water Systems.
- Supplement to Application for Approval – Form A: Determination of the Category of Drinking-Water System
- Supplement to Application for Approval – Form B: Existing Drinking-Water System Information
- Supplement to Application for Approval – Form C: Cost for Part V SDWA Applications

Instructions for completing these forms and additional information about applying for an Approval for a Drinking-Water Distribution System is available in the following publications:

- Pipe Data Form: Water Main, Storm Sewer, Sanitary Sewer and Force Main Design, Supplement to Application for Approval for Water and Sewage Works
- Guide for Applying for Approvals Related to Municipal and Non-Municipal Drinking-Water Systems – Parts IV and V of the Safe Drinking Water Act and Drinking-Water Systems Regulation

The following document has also been produced for a corresponding application for the residential development under Section 53 of the Ontario Water Resources Act (OWRA) - Sample Application Package for a Sanitary Sewage and Stormwater Collection System and Stormwater Management Facility Certificate of Approval (PIBS 6841e).

For more information about Certificates of Approval or to obtain an application package, please visit the Ministry of the Environment Internet site at http://www.ene.gov.on.ca or contact:

Ministry of the Environment
Environmental Assessment and Approvals Branch
2 St.Clair Ave. W, Floor 12A
Toronto, ON M4V 1L5

Toll Free: 1-800-461-6290
Phone: 416-314-8001
Fax: 416-314-8452
Email: EAABGen@ene.gov.on.ca

September 8, 2008

Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

RE: APPLICATION FOR APPROVAL OF WATER WORKS
ACME DEVELOPMENTS SUBDIVISION
ANYTOWN, ONTARIO

Dear Sir or Madam,

On behalf of ACME Developments Inc., this application is being made under Part V of the *Safe Drinking Water Act* (SDWA) for a proposed drinking water distribution system for the ACME Development Subdivision located in the City of Anytown.

Attached to this cover letter are the completed application forms and various supporting documentation for the above requested approval.

One (1) copy of the application is being submitted to the Environmental Assessment and Approvals Branch of MOE and one (1) copy is being submitted to the Othertown District Office of MOE. One cheque, payable to the Minister of Finance, for the application fee associated with the requested approval is attached to this cover letter in the amount of $1,200.

A separate application has been submitted for the ACME Development Subdivision under Section 53 of the Ontario Water Resources Act (OWRA) for a proposed sanitary and stormwater collection system and stormwater management facility. Please note that this application includes some components of the Section 53 OWRA application as the two application packages share common design reports and drawing details.

Should there be questions on any aspect of this submission, please do not hesitate to contact the undersigned.

Yours truly,

Consulting Ltd.

J. Consultant

Joe Consultant, P.Eng.
Senior Engineer

JC/cg

Attachments: Application Fee
Completed Application for Approval
Attachment 1: Proof of Legal Name
Attachment 2: Form A – Determination of the Category of Drinking-Water System
Attachment 3: Form B – Existing Drinking-Water System Information
Attachment 4: Form C – Cost for Part V SDWA Applications
Attachment 5: Legal Survey
Attachment 6: Summary of Consultation
Attachment 7: Record of Municipal Approval
Attachment 8: Name and Address of Operating Authority
Attachment 9: MOE Pipe Data Form
Attachment 10: Site Servicing Design Report (Attached separately)
Attachment 11: Design Drawings (Attached separately)

- Overall Site Plan, DWG. 08-0108-OS1
- Site Servicing Plan, DWG. 08-0108-SS1
- Profile Third Drive (Typical Sample), DWG. 08-0108-01
- Profile Fifth Road (Typical Sample), DWG. 08-0108-02
- Profile Eastern Outlet, DWG. 08-0108-06
- Grading and Drainage Plan (Typical Sample), DWG. 08-0108-GD1
- Detail Sheet, DWG. 08-0108-DS1
- Stormwater Management Facility Plan, DWG. 08-0108-SWMF1
- Stormwater Management Facility Details, DWG. 08-0108- SWMF2

CC: District Manager, Ministry of the Environment, Othertown, Ontario
Virginia Trust-Worthy, ACME Developments Inc.

Ontario

Ministry of the Environment

Ce formulaire est disponible en français

Application for Approval Related to Municipal and Non-Municipal Drinking-Water Systems

For Office Use Only			
Reference Number	Payment Received $	Date *(yyyy/mm/dd)*	Initials

General Information and Instructions

General:

Information requested in this form is collected under the authority of *Safe Drinking Water Act (SDWA*) and Drinking-Water Systems Regulation (O.Reg. 170/03) and will be used to evaluate applications for approval of municipal and non-municipal drinking-water systems as required by Sections 31, 36, 38, 52 and 60 of the SDWA..

Instructions:

1. When completing this form, please refer to the "Guide for Applying for Approvals Related to Municipal and Non-Municipal Drinking-Water Systems" (referred to as the Guide) and Minister's Order for Drinking-Water Approval Fees. Questions regarding completion and submission of the application should be directed to the Environmental Assessment & Approvals Branch, 2 St. Clair Avenue West, Floor 12A, Toronto, Ontario, M4V 1L5, telephone number 1-800-461-6290 or (416)314-8001, or to your local District Office of the Ministry of the Environment.

2. This form must be completed with respect to all the requirements identified in the Guide in order for it to be considered as an application for approval. INCOMPLETE APPLICATIONS WILL BE RETURNED TO THE APPLICANT.

3. A complete application consists of:
   (1) a completed and signed this application form, and completed Supplement to Application for Approval – Form A: Determination of the Category of Drinking-Water System, Supplement to Application for Approval – Form B: Existing Drinking-Water System Information, and Supplement to Application for Approval – Form C: Cost for Part V SDWA Applications;
   (2) all required supporting information identified in this form and in the Guide; and
   (3) a certified cheque or money order, in Canadian funds, made payable to the Minister of Finance, or completed VISA of MasterCard section of this application form for the applicable application fee.
   The Ministry may require additional information during the technical review of any application accepted as complete.

4. The original application, along with the supporting information and the application fee, must be sent to:
   The Ministry of the Environment,
   Director, Environmental Assessment and Approvals Branch,
   2 St. Clair Avenue West, Floor 12A, Toronto, Ontario, M4V 1L5
   A copy of the application and the supporting information must be sent to the local Ministry District Office which has jurisdiction over the area where the works are located.

5. Information contained in this application is not considered confidential and will be made available to the public upon request. Information submitted as supporting information may be claimed as confidential but will be subject to the *Freedom of Information and Protection of Privacy Act* (FOIPPA) and *EBR*. If you do not claim confidentiality at the time of submitting the information, the Ministry may make the information available to the public without further notice to you.

If the Client submits with the application a copy of their Master Business License (MBL) obtained from the Ministry of Consumer and Commercial Relations, the **shaded sections within this form do not need to be completed**. For additional information on the MBL please refer to the "Guide."

1. Client Information *(Owner of the drinking-water system)*

Client Name *(Legal name of individual or organization as evidenced by legal documents)*	Business Identification Number
ACME Developments Inc.	123456789

Business Name *(The name under which the entity is operating or trading if different from the Client Name - also referred to as trade name)*

Client Type:

- [X] Corporation
- [ ] Individual
- [ ] Partnership
- [ ] Sole Proprietor
- [ ] Federal Government
- [ ] Municipal Government
- [ ] Provincial Government
- [ ] Other *(describe)*:

Activity Classification Code/Standard Industrial Classification Code
(If unknown please complete Business Activity Description)

Business Activity Description *(A narrative description of the business endeavour, this may include products sold, services provided or machinery/equipment used, etc.)*

Drinking-Water Distribution System

2. Client Physical Address *(Complete A, C and D, **or** B, C and D)*

A. Civic Address- Street information *(Applies to an address that has civic numbering and street information includes street number, name, type and direction)*

123 Anywhere Street

Unit Identifier *(Identifies type of unit, such as suite & number)*

B. Survey Address *(Used for a rural location specified for a subdivided township, an unsubdivided township or unsurveyed territory)*

Lot and Conc.: used to indicate location within a subdivided township and consists of a lot number and a concession number.

Lot	Conc.

Part and Reference: used to indicate location within an unsubdivided township or unsurveyed territory, and consists of a part and a reference plan number indicating the location within that plan. Attach copy of the plan.

Part	Reference Plan

C. Municipality/Unorganized Township	County/District	Province/State	Country	Postal Code
Anytown	Prosperous County	Ontario	Canada	A1B 2C3

D. Telephone Number *(Including area code & extension)*	Fax Number *(Including area code)*	E-mail Address
905-555-1234	905-555-1235	vtm@acmedev.com

3. Client Mailing Address *(Complete A and C, **or** B and C)*

A. Civic Address - Street information *(Includes street number, name, type and direction)* ☒ Same as Client Physical Address | Unit Identifier *(Identifies type of unit, such as suite & number)*

B. Delivery Designator: ☐ Rural Route ☐ Suburban Service ☐ Mobile Route ☐ General Delivery | Delivery Identifier *(A number identifying a Rural Route, Suburban Service or Mobile Route delivery mode)*

C. Municipality	Postal Station	Province/State	Country	Postal Code

4. Site Information *(Location of the drinking-water system)*

Site Name	MOE District Office	Legal Description *(Attach copy of a legal survey)*
ACME Developments	Othertown	Attached

A. Site Address - Street information *(Applies to an address that has civic numbering and street information - includes street number, name, type and direction)* ☐ Same as Client Physical Address | Unit Identifier *(Identifies type of unit, such as suite & number*

B. Survey Address *(Used for a rural location specified for a subdivided township, an unsubdivided township or unsurveyed territory)* **NOTE:** Do not complete "B" if you completed "A."

Lot and Conc.: used to indicate location within a subdivided township and consists of a lot number and a concession number.

Lot	Conc.
27	11

Part and Reference: used to indicate location within an unsubdivided township or unsurveyed territory, and consists of a part and a reference plan number indicating the location within that plan. Attach copy of the plan.

Part	Reference Plan
	4M-XXX

C. Non Address Information *(Any additional information to clarify clients' physical location)*

D. Geo Reference

Map Datum	Zone	Accuracy Estimate	Geo Referencing Method	UTM Easting	UTM Northing
NAD 83	18	+/- 10 m	1:50,000 Base	999999	999999

E. Municipality/Unorganised Township	County/District	Postal Code
Anytown	Prosperous County	B2C 3D4

F. Adjacent Land Use

☐ Industrial ☐ Commercial ☐ Recreational
☐ Residential ☒ Agricultural ☐ Other*(specify)*:

G. Is the Site located in an area of development control as defined by the Niagara Escarpment Planning & Development Act (NEPDA)?

☐ Yes (If Yes, attach copy of NEPDA permit for the proposed activity/work) ☒ No

H. Is the Client the operating authority? ☐ Yes ☒ No

If No, complete Table 1 of the **Supplement to Application for Approval - Form B** (if Form B not applicable, attach the operating authority's name, address and phone number)

I. Is the Client the owner of the land (site)? ☒ Yes ☐ No

If No, attach the owner's name, address and consent for the installation and operation of the facilities.

J. Is the Site located within the Oak Ridges Moraine Conservation Area as defined by the Oak Ridges Moraine Conservation Plan - a regulation under the Oak Ridges Moraine Conservation Act (ORMCA)?

☐ Yes (If Yes, attach proof of municipal planning approval for the activity) ☒ No

5. Project Technical Information Contact *(Complete A, B, D and E **or** A, C, D, and E)*

A. Name *(Surname, Given name)* | Company ☐ Same as Client Name

Joe Consultant | Consulting Ltd.

Contact Address

B. Civic Address - Street information *(Includes street number, name, type and direction)* ☐ Same as Client Mailing Address | Unit Identifier *(identifies type of unit, such as suite & number)*

234 Other Street | Suite 2

C. Delivery Designator: ☐ Rural Route ☐ Suburban Service ☐ Mobile Route ☐ General Delivery | Delivery Identifier *(A number identifying a Rural Route, Suburban Service or Mobile Route delivery mode)*

D. Municipality	Postal Station	Province/State	Country	Postal Code
Anytown		Ontario	Canada	C3D 4E5

E. Telephone Number *(Including area code & extension)*	Fax Number *(Including area code)*	E-mail Address
950-555-2345	905-555-2399	joe.consultant@conltd.com

6a. Drinking-Water System Category *(Based on completed Supplement to Application for Approval - Form A)*

☒ Large Municipal Residential Drinking-Water System
☐ Small Municipal Residential Drinking-Water System
☐ Large Municipal Non-Residential Drinking-Water System
☐ Small Municipal Non-Residential Drinking-Water System
☐ Non-Municipal Year-Round Residential Drinking-Water System
☐ Non-Municipal Seasonal Residential Drinking-Water System
☐ Large Non-Municipal Non-Residential Drinking-Water System
☐ Small Non-Municipal Residential Drinking-Water System

6b. Drinking-Water System - Project Information

Type of Application:	Current Certificate of Approval		Transfer of Review
[X] New Certificate of Approval for a drinking-water system [ ] Amendment to current Certificate of Approval for a drinking-water system [ ] Certificate of Approval for Fragmentation (municipal system) [ ] Director's Consent for Fragmentation (non-municipal system) [ ] Revocation of Current Certificate of Approval	Certificate of Approval Number	Date of Issue *(yyyy/mm/dd)*	[ ] Yes [X] No

Has a completed Pipe Data Form been included with this application? [X] **Yes** [ ] **No** *If water mains are part of the proposed works, Pipe Data Form is required.*

Does the application constitute or include a request for approval of relief from regulatory requirements? [ ] **Yes** *(If "Yes", indicate below the type of relief requested)* [X] **No**

[ ] Relief from All Treatment Requirements *(only for systems using ground water sources exclusively)* [ ] Other Regulatory Relief

Project Description Summary *(If application pertains to an existing drinking-water system, first complete **Supplement to Application For Approval – Form B**, and indicate here how this project would change that information)*

Installation of PVC DR 18, Class 150 watermain and appurtenances for subdivision development in the City of Anytown. Minimum cover is 2.4 mm with clear horizontal separation of 3.0 m and minimum clear vertical separation of 0.5 m. Minimum diameter is 150 mm.

Street	From	To	Diameters
Second Way	Third Drive	Fifth Road	150, 200
Third Drive	Gorde Street	Second Way	300
Fifth Road	Second Way (N)	Second Way (S)	200
Sixth Street	Second Way (N)	Second Way (S)	150

Receiver of Effluent Discharge *(Discharge from water treatment plant backwash/residue management system)*	Watershed Name
Project Name *(Project identifier to be used as a reference in correspondence)* ACME Development Subdivision	Water Works Number *(Provide If known)*

Project Schedule

Estimated date for start of construction/installation [(yyyy/mm/dd)	Estimated date for start of operation *(yyyy/mm/dd)*
2009/05/01	2010/05/01

7. Other Approvals / Permits

List all other environmental approvals/permits applied for related to this project or received in relation to this project under the *Environmental Protection Act* (discharges to air, waste management, etc.) and the *Ontario Water Resources Act* (sewage works, water taking), and the Safe Drinking Water Act (drinking-water systems).

Section 53, OWRA application for stormwater management facility and application for sanitary and storm sewers

8. Public Consultation/Notification

Specify all public consultation/notification *(such as public hearings, notification of First Nations, etc.)* related to the project that has been completed or is in the process of being completed.

Draft plan approval process (06T-06010)

9. Environmental Bill of Rights Requirements - Not Applicable

10. Environmental Assessment Act (EAA) Requirements

[ ] The works for which this application is made have fulfilled all requirements of the EAA through the completion of:

Municipal Class EA has been completed in accordance with the procedure set out in:

[ ] Schedule A [ ] Schedule B [ ] Schedule C

[ ] The works are exempt from requirements of the EAA under:

[ ] Section _____ of the Ontario Regulation No. _____ [ ] Exemption Order _____

If Regulation or Exemption Order does not refer directly to these works, state in covering letter or other document why it does apply to the works.

[ ] The works are proceeding in accordance with the Environmental Assessment Process Approval Notice specified below:

[X] The works are not subject to the EAA for the reason specified below:

11. Supporting Information Checklist - *This is a list of all supporting information to this application and is subject to the FOIPPA .*

Supporting information	Attached		Reference	Can be disclosed	
General					
Form A: Determination of the Category of Drinking-Water System	☒ Yes	☐ No	Attachment 2	☒ Yes	☐ No
Form B: Existing Drinking-Water System Information	☒ Yes	☐ No	Attachment 3	☒ Yes	☐ No
Form C: Cost for Part V SDWA Applications	☒ Yes	☐ No	Attachment 4	☒ Yes	☐ No
Pre-application consultation record	☒ Yes	☐ No	Attachment 6	☒ Yes	☐ No
Proof of legal name of Client	☒ Yes	☐ No	Attachment 1	☒ Yes	☐ No
Copy of NEPDA Permit (Niagara Escarpment)	☐ Yes	☒ No		☐ Yes	☐ No
ORMCA compliance documentation (Oak Ridges Moraine)	☐ Yes	☒ No		☐ Yes	☐ No
Name, address and phone number of the Operating Authority	☒ Yes	☐ No	Attachment 8	☒ Yes	☐ No
Name, address and consent of land/site owner	☐ Yes	☒ No		☐ Yes	☐ No
List of ground water sources used by this drinking water system	☐ Yes	☒ No		☐ Yes	☐ No
List of surface water sources used by this drinking water system	☐ Yes	☒ No		☐ Yes	☐ No
Technical					
Detailed description of the proposed works	☒ Yes	☐ No	Attachment 10	☒ Yes	☐ No
Environmental Study Report (ESR)	☐ Yes	☒ No		☐ Yes	☐ No
Preliminary engineering report	☐ Yes	☒ No		☐ Yes	☐ No
Site plan	☒ Yes	☐ No	Attachment 11	☒ Yes	☐ No
Design brief/report	☒ Yes	☐ No	Attachment 10	☒ Yes	☐ No
Hydraulic and process calculations	☒ Yes	☐ No	Attachment 10	☒ Yes	☐ No
Final plans and specifications	☐ Yes	☒ No		☐ Yes	☐ No
Source water quality analysis	☐ Yes	☒ No		☐ Yes	☐ No
Hydrogeological Assessment for potential GUDI source	☐ Yes	☒ No		☐ Yes	☐ No
Treatability Study	☐ Yes	☒ No		☐ Yes	☐ No
Hydrogeological report on ground water well development	☐ Yes	☒ No		☐ Yes	☐ No
Permit to Take Water	☐ Yes	☒ No		☐ Yes	☐ No
Process waste water/residue management program	☐ Yes	☒ No		☐ Yes	☐ No
Treatment process monitoring program	☐ Yes	☒ No		☐ Yes	☐ No
Hydrogeologist's assessment for relief under Sch.4 O.Reg. 170/03	☐ Yes	☒ No		☐ Yes	☐ No
Engineer's assessment for relief under Sch. 5 O.Reg. 170/03	☐ Yes	☒ No		☐ Yes	☐ No
Hydrogeologist's/Engineer's assessment for other regulatory relief	☐ Yes	☒ No		☐ Yes	☐ No
Engineer's assessment for fragmentation	☐ Yes	☒ No		☐ Yes	☐ No
Owner's report on user notiffication for fragmentation	☐ Yes	☒ No		☐ Yes	☐ No
Other Attached Information	☐ Yes	☒ No		☐ Yes	☐ No

12. Application Fee

Category Code	Category Description	Amount	Quantity	Sub Total
5	Watermain	$1,200.00	1	$1,200.00

Total Fee : $1,200.00

Payment Information

Method of Payment: ☒ Certified Cheque ☐ Money Order ☐ VISA (max. $10,000) ☐ MasterCard (max. $10,000)

Amount Enclosed: $1,200.00

VISA/MasterCard Number:

Expiry Date: *(mm/yy)*

Name of Cardholder *(please print as it appears on the VISA/Mastercard)*:

Signature of Cardholder:

13. Statement of Client

I, the undersigned hereby declare that, to the best of my knowledge, the information contained herein and the information submitted in support of this application is complete and accurate in hat the Project Technical Information Contact identified in section 5 of this form is authorized to act on my behalf for the purpose of obtaining approval under Sections 31, 36, 38, 52 and 60 of the SDWA for the drinking-water systems identified herein.

Name *(Surname, Given Name) (please print)*	Title
Trust-Worthy, Virginia	Manager
Signature *Virginia Trustoworthy*	Date *(y/m/d)* 2008/09/05

14. Statement of Municipality

I, the undersigned hereby declare on behalf of the Municipality, that the Municipality has no basic objection to the construction of the works in the Municipality.

Name and Title *(please print)*	Name of Municipality
Walter Main, Public Works Manager	City of Anytown
Signature *Walter Main*	Date *(y/m/d)* 2008/09/05

ATTACHMENT 1
PROOF OF LEGAL NAME

Ontario

Sample of a Master Business Licence

Date Issued: ⧖✢✯✤ ✈
(yyyy-mm-dd)

Business Name and Mailing Address:

⧖✢✯✤ ✈✯✢!!
⌐⌙◘ ⧖✯✸✶✧✤✱✤ ⊷✳✱✤✤✳
⧖✯✸✳✯✶✯▃ ✎✯✳✠✱✯
✍□✍ ⌐⧖⌐

Business
Address: SAME AS ABOVE

Telephone: ⧖✢✯✤ ✈✯✢!! Ext: Fax: ⧖✢✯✤ ✈✯✢!!

E-Mail: ⧖✢✯✤ ✈✯✢!!

Legal
Name(s): ⧖✢✯✤ ✈✯✢!!

Type of
Legal Entity: ⧖✢✯✤ ✈✯✢!!

Business Information	Number	Effective Date (yyyy-mm-dd)	Expiry Date (yyyy-mm-dd)
Acme Inc	123456789	⧖✢✯✤ ✈	⧖✢✯✤ ✈

To the Client: When the Master Business Licence is prestnted to any Ontario business program, you are not required to repeat information contained on this licence. Each Ontario business program is required to accept this licence when presented as part of its registration process.
Call the Ontario Business Connects Helpline at 1-800-565-1921 or (416) 314-9151 or TDD (416) 326-8566 if you have any problems.

To the Ontario business program: A client is not required to repeat any information contained in this licecen in any other form used in your registration process.

00/00

000 000/000-00000000000 BATCH 0000

ATTACHMENT 2
FORM A – DETERMINATION OF THE CATEGORY OF DRINKING-WATER SYSTEM

Ministry of the Environment | Ministère de l'Environnement

Ontario

Supplement to Application for Approval - Form A
DETERMINATION OF THE CATEGORY OF DRINKING-WATER SYSTEM

This form is to be completed for all applications made under Safe Drinking Water Act (SDWA) and Drinking-Water Systems Regulation (O. Reg. 170/03) received by the Environmental Assessment & Approvals Branch on or after June 1, 2003. O. Reg. 170/03 defines eight categories of drinking water systems and specifies the requirements to be met by each. The purpose of this supplement is to determine what type of Drinking-Water System is being applied for. Please submit this form with your completed Application for Approval Related to Municipal and Non-Municipal Drinking-Water Systems.

Please answer the following questions. Indicate Y for Yes and N for No in the appropriate columns and follow the instructions beside it. Once you are finished you will know the category of your system.

Item	Question	YES	If YES	NO	IF NO
A	Does this Drinking Water System (DWS) use electricity or serves any building or other structure that uses electricity?	Y	Go to B		Notices are to be posted, water fountains rendered inoperative then Go to X
B	Is this DWS municipal or will be owned by a municipality based on O.Reg. 172/03?	Y	Go to C		Go to E
C	Does this DWS serve more than 100 private residences?	Y	**This System is Large Municipal Residential**		Go to D
D	Does this DWS serve more than 5 but less than 101 private residences?		**This system is Small Municipal Residential**		Go to I
E	Does this DWS serve more than 5 private residences or a trailer park or campground with more than 5 service connections?		Go to F		Go to G
F	Does this DWS operate seasonally?		**This system is Non-Municipal Seasonal Residential**		**This system is Non-Municipal Year Round Residential**
G	Does this DWS have a capacity more than 2.9 litres/sec?		Go to the Calculation for Non-Municipal Systems		Go to H
H	Does this DWS serve a Designated Facility or a Public Facility?		**This system is Small Non-Municipal Non-Residential**		Go to X
I	Does this DWS have a capacity more than 2.9 litres/sec?		Go to calculation for Municipal System		Go to J
J	Does this DWS serve a Designated Facility or a Public Facility?		**This system is Small Municipal Non-Residential**		Go to X
X	Based on the answers you have given this drinking-water system is currently exempt from the provisions of O. Reg. 170/03. To enable the ministry to supply you with notices and information that will assist you to keep up to date on new challenges which might impact the quality of water you provide please complete and submit only the information set out in Part II: Drinking-Water System - Owner Information, Operator's Information and Drinking-Water System's Operational Information.				

Calculation for Large Non-Residential Drinking-Water System (Both Municipal and Non-Municipal)

If this Drinking-Water System has one or more dedicated distribution lines that supply water exclusively for the listed operations then this calculation may be undertaken to determine if the existence of these operations alters category of the Drinking-Water System.

	YES	If "YES"	NO	If "NO"
I) Does your Drinking-Water System have one or more distribution lines that supply water exclusively for either of the following operations. ☐ Agricultural ☐ Landscaping ☐ Industrial or Manufacturing (including food manufacturing and processing) ☐ Swimming pool ☐ Skating rink construction ☐ Maintenance		Complete the calculation (A-B)		This system is **Large Municipal Non-Residential** **or** **Large Non-municipal Non-residential**
CALCULATION **A** = Maximum Rate at which the Drinking-Water System can supply water in litres/sec **B** = The sum of average rates in litres/sec (actual or estimated) at which the Drinking-Water System supplied water to the dedicated distribution lines during the preceding year (January through December)				
Calculate A-B A - B = ? ☐ - ☐ = ☐		If **A-B** is equal to or less than 2.9 litres/sec Go to J for municipal systems Go to H for non-municipal systems		If **A-B** is more than 2.9 litres/sec This system is **Large Municipal Non-Residential** **or** **Large Non-municipal Non-residential**

Definitions

Seasonal System Means
A Drinking-Water System that does not operate for 60 or more consecutive days in a fiscal (April 1st to March 31st)/ Calendar (Jan 1st to Dec 31st) year/ 365 day period that begins on the day the drinking-water system begins operation

Public Facility Means
(a) Food Premises, as defined in the Health Protection and Promotion Act
(b) A place that operates primarily for the purpose of providing overnight accommodation to the traveling public
(b.1) A trailer park or campground
(c) A marina
(d) A church, mosque, synagogue, temple or other places of worship
(e) A recreational camp
(f) A recreational or athletic facility
(g) A place, other than a private residence, where a service club or fraternal organization meets on a regular basis
(h) Any place where general public has access to a washroom, drinking water fountain or shower
(i) And does not include a designated facility

Designated Facility Means
(a) A children's camp
(b) A delivery agent care facility
(c) A health care facility
(d) A school or private school
(e) A social care facility
(f) A university, a college of applied arts and technology or an institution with authority to grant degrees

Private Residence is a dwelling place occupied for an extended period of time by the same person if
(a) The residents have a reasonable expectation of privacy
(b) Food preparation, personal hygiene and sleeping accommodations are not communal in nature and
(c) Any use of the dwelling place by a resident for a home occupation, trade, business, profession or craft is secondary to the use of the dwelling place as a residence and does not use more than 25 per cent of the indoor floor area.

ATTACHMENT 3
FORM B – EXISTING DRINKING-WATER SYSTEM INFORMATION

Ministry of the Environment | Ministère de l'Environnement

Ontario

Supplement to Application for Approval - Form B
EXISTING DRINKING-WATER SYSTEM INFORMATION

This form is to be completed for all applications made under Safe Drinking Water Act (SDWA) and Drinking Water Systems Regulation (O. Reg. 170/03) received by the Environmental Assessment & Approvals Branch on or after June 1, 200. Please submit this form with your completed Application for Approval Related to Municipal and Non-Municipal Drinking-Water Systems.

Table-1. Drinking Water System Operator Information - Complete A, B, D and E or A, C, D, and E

A. Name	Company	☐ Same as Client Name
Walter Main	City of Anytown	

Contact Address	☐ Same as Client Mailing Address	Unit Identifier *(identifies type of unit, such as suite & number)*
234 Water Street		

C. Delivery Designator: ☐ Rural Route ☐ Suburban Service ☐ Mobile Route ☐ General Delivery	Delivery Identifier *(a number identifying a Rural Route, Suburban Service or Mobile Route delivery)*

D. Municipality	Postal Station	Province/State	Country	Postal Code
Anytown		Ontario	Canada	N9A 1B2

E. Telephone Number *(including area code & extension)*	Fax Number *(including area code)*	E-mail Address
(905) 555 - 6789	(905) 555 - 6780	wmain@cityanytown.ca

Table 2- Drinking-Water System Technical Information

Drinking Water System Information		
Design/Rated Capacity (litres per second): 4040	Population Served: 230,000	Point of Entry Information

			If "Yes"
Is Disinfection Provided?	☒ Yes	☐ No	What disinfection method is used? Ozone / Chlorine
Is chemically assisted filtration or the equivalent provided?	☒ Yes	☐ No	
Does the drinking-water system cease operation for more than 60 days (operates seasonally)?	☐ Yes	☒ No	If "Yes" — What are the months of operation? (mm to mm)
Does the drinking-water system shut down for a period of 7 or more consecutive days?	☐ Yes	☒ No	If "Yes" — How many times per year? / Please attach a list of all shut down periods (dd-mm to dd-mm)
Does this drinking water system supply a designated facility? **[Not applicable to municipal residential systems]**	☐ Yes	☐ No	If "Yes" — Number of designated facilities / Please attach a list of all designated facilities.
Does this drinking water system use ground water sources?	☐ Yes	☒ No	If "Yes" — Number of wells supplying system / Please attach a list of all ground water sources.
Does this drinking water system use surface water sources?	☒ Yes	☐ No	If "Yes" — Number of surface water sources: 1 / Please attach a list of all surface water sources.

Local Public Health Unit: Prosperous County Health Unit

Drinking Water Distribution System and Plumbing					
Is there booster disinfection station in the distribution system or plumbing?	☒	Yes	☐	No	
Is fluoride added within the distribution system or plumbing?	☒	Yes	☐	No	
Is this a municipal system that receives all its water through a connection to another system,	☐	Yes	☒	No	If "Yes" What is the population served?

Drinking Water System Supply and Transportation					
Does this drinking water system receive transported water?	☐	Yes	☒	No	
If "Yes"					
Name of the system that supplies the drinking water (if more than one, please attach a list)					
How is the water transported ?					
Does the supplying drinking-water system provide secondary disinfection?	☐	Yes	☐	No	
Does this drinking water system receive water from another drinking water system?	☐	Yes	☒	No	
If "Yes"					
Name of supplying drinking-water system (if more than one, please attach a list)					
Name Of Owner of drinking-water system supplying water					
Municipality that the supplying drinking water system is located in					
Does the supplying drinking-water system provide secondary disinfection?	☐	Yes	☐	No	
If "Yes"					
What is the secondary disinfection method?					
If the Secondary disinfection method is other than chlorination or chloramination, is it approved by the director (*for Municipal Large and Small Drinking Water Systems*) or by a Professional Engineer *(for other classes of Drinking -Water Systems.*)?	☐	Yes	☐	No	
Does this drinking water system provide water to another drinking water system?	☐	Yes	☒	No	
If "Yes"					
Name of drinking-water system that receives water from this drinking-water system					
Name Of Owner of drinking-water system receiving the water					
Municipality that the receiving drinking-water system is located in					
Does this drinking water system own any of the raw-water sources?	☐	Yes	☒	No	
If "Yes" please attach a list of the raw water sources including well(s), intake pipe(s) in river(s)/lake(s) and GUDI					
Does this drinking water system do any treatment?	☒	Yes	☐	No	
Does this drinking water system have standby disinfection?	☐	Yes	☒	No	
Does this drinking water system own any of the distribution system/plumbing?	☒	Yes	☐	No	
If "Yes"					
Does this drinking water system do booster chlorination in the distribution system/plumbing?	☒	Yes	☐	No	

ATTACHMENT 3.1
LIST OF ALL SURFACE WATER SOURCES

Supplement to Application for Approval – Form B
Existing Drinking Water-System Information

Table 2 – Drinking Water System Technical Information

List of all Surface Water Sources

1. Anywhere River

ATTACHMENT 4
FORM C – COST FOR PART V SDWA APPLICATIONS

Ministry of the Environment | Ministère de l'Environnement

Ontario

Supplement to Application for Approval - Form C
COST FOR PART V SDWA APPLICATIONS

This form is to be completed for all applications under Part V of the ***Safe Drinking Water Act*** (SDWA) submitted to the Environmental Assessment & Approvals Branch on or after June 1, 2003. This form reflects the cost for applications for approval under the SDWA, as per the Minister's Order for Drinking-Water Approval Fees.

Please refer to the tables in the attached "Summary of Drinking-Water Systems SDWA Costs" when completing this form. These tables summarize the applicable costs and categories. The Summary of Drinking-Water Systems SDWA Costs should be retained for future use and the completed form should be attached to the "Application for Approval Related to Municipal and Non-Municipal Drinking-Water Systems for submission to the branch.

Company Name:	Application No. *(if known):*
Acme Developments Inc.	

Application Cost: Indicate the type of application and complete the corresponding **Section 1, 2, or 3.**

- ☒ **Section 1: Approvals (Table 1)**
- ☐ **Section 2: Amendment to existing approval:**
  - ☐ **Administrative amendments (Table 2(a))**
  - ☐ **Amendments requiring a technical review (Table 2(b))**
- ☐ **Section 3: Revocations (Table 3)**

SECTION 1: APPROVALS

Table 1: Approvals

	Category	Cost
	Category 1 - Administrative processing **(applies to all)**	**$ 200**
	From the attached summary table, under the section entitled "Table 1 - Approvals", indicate the appropriate categories applicable to the application and the corresponding costs (Categories 2 to 7). Category applied for 5 Cost $ 1,000 _____ Cost $ _____ _____ Cost $ _____ *(Indicate all applicable categories and the corresponding cost.)* **Total Cost:** 1000	$ 1000
TOTAL COST		$ 1200

SECTION 2: AMENDMENT TO EXISTING APPROVAL

Table 2(a): Administrative Amendments

	Category	Cost
	Category 8 - If the amendment is considered as administrative (no technical review is required), the total cost of the application is $100.	**$ 100**
	Category 100 - Amendments necessary as a result of action that the applicant has been required to take by the Director pursuant to a condition contained in a certificate.	**$ 0**
TOTAL COST		**$**

Table 2(b): Amendments Requiring a Technical Review

	Category	Cost
	Category 1 - Administrative processing (applies to all except category 100).	**$ 200**
	Category 100 - Amendments necessary as a result of action that the applicant has been required to take by the Director pursuant to a condition contained in a certificate.	**$ 0**
	From the attached summary table, under the section entitled Amendments (Technical), indicate the appropriate categories applicable to the application (ie one or more of 7, 9, 10, 11) and the corresponding costs: Category applied for _____ Cost $ _____ _____ Cost $ _____ _____ Cost $ _____ *(Indicate all applicable categories and the corresponding cost.)* **Total Cost:** _____	
TOTAL COST		**$**

SECTION 3: REVOCATION OF EXISTING APPROVAL

Table 3: Revocation of existing approval

	Category	Cost
	Category 12 - Administrative revocations (no technical review involved)	**$ 0**
	Category 200 - Revocation required necessary as a result of action that the applicant has been required to take by the Director pursuant to a condition contained in a certificate.	**$ 0**
	If a technical review is involved reviewing the application for the revocation, the applicable costs are outlined under **Section 1 - Approvals.** Please complete Table 1 and indicate the total cost on the right.	**$**
TOTAL COST		**$**

SUMMARY OF DRINKING-WATER SYSTEMS SDWA COSTS

Table 1: APPROVALS (for new works or equipment)
TOTAL COST = 1 (always) + (Total of one or any combination of 2 ,3,4, 5, 6) + 7 (if applicable)

CATEGORY	TYPE OF APPLICATION	COST ($)
1	Administrative processing (applies to all applications for new works or equipment)	$200
2	The new intake or extraction of surface or ground water, together with treatment other than disinfection, or the expansion of the capacity of an existing intake or extraction of surface or ground water, together with treatment other than disinfection.	$5,000, if the maximum design capacity is not more than 4,550 cubic metres per day
3	The new intake or extraction of surface or ground water, together with treatment other than disinfection, or the expansion of the capacity of an existing intake or extraction of surface or ground water, together with treatment other than disinfection	$10,000, if the maximum design capacity is more than 4,550 cubic metres per day
4	A facility for the extraction and supply of ground water with no treatment other than disinfection.	$2000
5	Watermains and appurtenances, including hydrants.	$1000
6	Highlift and booster pumping stations, reservoirs or elevated tanks.	$2000
7	Review of Hydrogeological Assessment	$3000

Table 2(a): AMENDMENTS (ADMINISTRATIVE)

CATEGORY	TYPE OF APPLICATION	COST ($)
8	Administrative amendments (no technical review involved)	$100
100	Amendment required as a result of a condition on a existing approval.	$0

Table 2(b): AMENDMENTS (TECHNICAL)
TOTAL COST = 1(always) +(Total of one or any combination of categories 9 ,10, 11) +7 (if applicable)

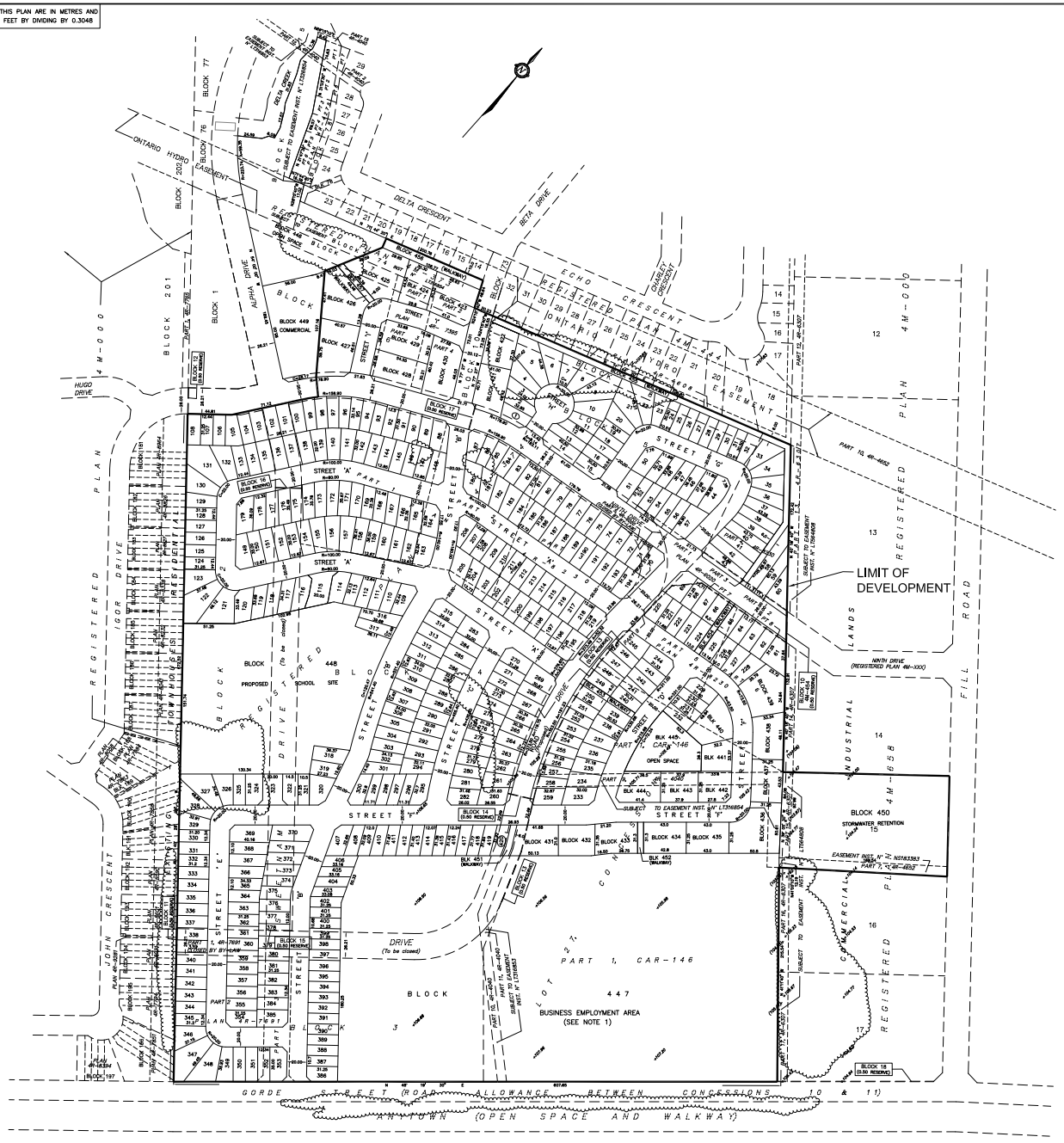
1	Administrative processing (applies to all amendment, except administrative amendments)	$200
9	A. a treatment plant upgrade, including new treatment (such as chemical coagulation and flocculation, settling, granular media filtration, membrane filtration, or contaminant absorption or disinfection) at existing water supply plants, new plant process waste stream treatment and disposal facilities, additional or replacement treatment modules, and the establishment, alteration, expansion or replacement of an intake facility, or B. a process modification, including the alteration, extension or replacement of an existing pumping system or chemical storage or application system (such as a change of chemical filter media or a standby power supply system) and the provision of additional points of process chemical application.	$3000
10	if the application relates to the alteration, extension or replacement of an existing well, including provision of an additional well to serve as a standby and the provision of disinfection and disinfection control facilities	$1200
11	in any other case	$600
7	Review of Hydrogeological Assessment	$3000
100	Amendment required as a result of a condition on an existing approval	$0

Table 3: REVOCATIONS

12	Administrative revocations (no technical review involved)	$0
200	Revocation required as a result of a condition on an existing approval	$0
500	If a technical review is involved in reviewing the application for the revocation, the applicable costs are outlined under APPROVALS (for new works or equipment), above, where TOTAL COST = 1 (always) + (Total of one or any combination of 2 ,3,4, 5 ,6) + 7 (if applicable)	as calculated

ATTACHMENT 5
LEGAL SURVEY

METRIC DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048



DRAFT PLAN OF SUBDIVISION OF
PART OF REGISTERED PLAN 4M–XXX

AND
PART OF LOT 27, CONCESSION 11
CITY of ANYTOWN
PROSPEROUS COUNTY

SCALE 1 : 2000
0 20 50 100 150 metres

JOE SURVEYING LIMITED
ONTARIO LAND SURVEYORS
1998

SECTION 51 (17) OF THE PLANNING ACT

a) SHOWN ON PLAN
b) SHOWN ON PLAN
c) SHOWN ON KEY PLAN
d) SEE LAND USAGE TABLE
e) SHOWN ON PLAN & KEY PLAN
f) SHOWN ON PLAN
g) SHOWN ON PLAN PROJECTION, CONTOURS BUSH, ETC.
h) WATER SUPPLY WILL BE FROM MUNICIPAL MAINS
i) SEE SOILS REPORT
j) SHOWN ON PLAN
k) FULL URBAN MUNICIPAL SERVICES
l) SHOWN ON PLAN

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AS SHOWN ON THIS PLAN AND THEIR RELATIONSHIP TO ADJOINING LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

DATE

JOE SURVEYOR
ONTARIO LAND SURVEYOR

LAND USAGE TABLE

LOTS / BLOCKS	AREA (ha.)	UNITS	REMARKS
1 – 60	2.851	60	
220 – 224	0.198	5	SMALL *
229 – 232	0.585	4	SINGLE
295 – 300	0.236	6	FAMILY LOTS
320 – 322	0.143	3	
386 – 406	0.719	21	
TOTAL	4.732	99	
61 – 219	7.043	159	
225 – 228	0.177	4	* LARGE
233 – 294	2.610	62	SINGLE
301– 319	0.817	19	FAMILY LOTS
323 – 385	2.846	63	
407 – 420	0.548	14	
TOTAL	14.041	321	
BLOCKS 421–444	3.643	126	TOWNHOUSES
BLOCKS 445,446	1.685		OPEN SPACE
BLOCK 447	9.239		BUSINESS EMPLOYMENT AREA
BLOCK 448	2.857	N/A	PROPOSED SCHOOL
BLOCK 449	0.487		COMMERCIAL
BLOCK 450	0.806		STORMWATER RETENTION AREA
BLOCKS 451–457	0.533		WALKWAY/ACCESS
STREETS A–I	6.238		STREETS
TOTAL	44.261	546	

* SMALL DENOTES 10.5m MINIMUM FRONTAGE
LARGE DENOTES 12.0m MINIMUM FRONTAGE

NOTE: 1:2,000 SCALE ON ORIGINAL 'D' SIZE DRAWING

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

APPROVED | APPROVED | APPROVED

PROJECT
ACME DEVELOPMENT INC.
ACME ANYTOWN SUBDIVISION
THE CITY OF ANYTOWN

TITLE
SURVEY PLAN

PROJECT No.	Your Project No.		FILE No. SURVEY DRAWING.dwg		
DESIGN	J.C.	27 Aug. 2008	SCALE	AS SHOWN	REV.
CAD	J.D.	28 Aug. 2008	FIGURE		
CHECK	J.C.	29 Aug. 2008	**08-0108-SUR**		
REVIEW	P.M.	30 Aug. 2008			

PLOT DATE: February 26, 2009
FILENAME: N:\Active\2008\1110\dft-1110-0108 ACME MDS\Residential Services\DWG\FEB 21 2009 (UPDATE)\SURVEY DRAWING-2.dwg

ATTACHMENT 6
SUMMARY OF CONSULTATION

MEMORANDUM

TO File **DATE** January 23, 2008

CC Earl Baker, MOE Othertown Office

FROM Joe Consultant **DOCUMENT No.** 08-XXXX

ACME DEVELOPMENTS SUBDIVISION CONSULTATION

Joe Consultant met with the local MOE office (Earl Baker, District Engineer) on 22 January, 2008 to review the proposed subdivision development by ACME Developments, to be located in Anytown, this is a summary of the discussion:

- Existing watershed is the Clean River Watershed
- Based on consultation with the Clean River Conservation Authority (CRCA) and review of the Anytown Master Drainage Plan, stormwater quality control is required to meet pre/post runoff up to 1:100 year event
- Quality control required to provide Normal (70% TSS removal) protection for subdivision development
- MOE (Earl Baker, District Engineer) concurred with these assessments
- Water distribution system will require approval (SDWA)
- Sanitary and storm sewers and storm water management will require approval (OWRA)

ATTACHMENT 7
RECORD OF MUNICIPAL APPROVAL

PROSPEROUS COUNTY CONDITIONS FOR FINAL APPROVAL
ACME DEVELOPMENTS INC.
ANYTOWN SUBDIVISION
DRAFT APPROVED BY THE ONTARIO MUNICIPAL BOARD 21/07/2007

The County of Prosperous' conditions applying to the approval of the final plan for registration of ACME Developments Inc. Anytown Subdivision (06T-06010) are as follows:

GENERAL

1. This approval applies to the draft plan certified by Joe Surveyor OLS, dated 1 June 2006, showing 292 lots for single detached dwellings, 1 block for parkland, 1 commercial, 1 elementary school block and one block for stormwater purposes.

2. The owner agrees, by entering into subdivision agreements, to satisfy all requirements, financial and otherwise, of the City of Anytown, including but not limited to, the phasing of the plan for registration, the provision of roads, installation of services and utilities, and drainage. **Anytown**

3. The plan shall be revised to place 0.3 m reserves in the following locations:

    A) the southern boundary of Block No. 449 including the daylighting triangle; **Anytown**

    B) the south boundary of Blocks Nos. 421, 427, 430, Lot Nos. 1, 14, 15 and 43 including any daylighting triangles;

    C) the south boundary of Block No. 447, Lot Nos. 386 and 347 to 353;

    D) the east side of Lot Nos. 88, 109, 148, 163, 164, and 353 inclusive of any daylighting triangles; and

    E) the west side of Lot Nos. 87, 180, 206, 205, 300 and 407.

ATTACHMENT 8
NAME AND ADDRESS OF MUNICIPAL AUTHORITY

NAME AND ADDRESS OF OPERATING AUTHORITY

City of Anytown
234 Water Street
Anytown, Ontario
N9A 1B2
Tel. (905) 555-6789
Fax (905) 555-6790
Contact: Walter Main
Public Works Manager

ATTACHMENT 9
MOE PIPE DATA FORM

Ministry of the Environment | Ministère de l'Environnement

Ontario

PIPE DATA FORM

WATERMAIN, STORM SEWER, SANITARY SEWER, AND FORCEMAIN DESIGN

SUPPLEMENT TO APPLICATION FOR APPROVAL FOR WATER AND SEWAGE WORKS

General:

Information requested in this form is collected under the authority of the *Ontario Water Resources Act* (OWRA), the *Safe Drinking Water Act* (SDWA), the Drinking-Water Systems Regulation (O. Reg. 170.03) and the *Environmental Bill of Rights* (EBR). This information will be used to evaluate applications for approval of municipal and private sewage works as required by section 53 of the OWRA and to evaluate applications for approval of municipal and non-municipal drinking-water systems as required by sections 31, 36, 38, 52 and 60 of the SDWA.

Instructions:

1. This form should accompany all applications for a Water and Sewage Works. It does not replace the application form for a Certificate of Approval and is required in addition to the supporting technical information described in the Guide for Applying for Municipal and Private Water and Sewage Works. All designs are expected to be in accordance with MOE design guidelines and the 10 State Standards, as updated from time to time.

2. The information contained in this form and the required supporting stamped engineering drawings are the minimum information requirements used to process the application for a Certificate of Approval. All sections MUST be filled out and incomplete forms will be RETURNED to the applicant.

3. Application forms and supporting documentation are available from the Environmental Assessment and Approvals Branch toll free at 1-800-461-6290 (locally at 416-314-8001), from your local District Office of the Ministry of the Environment, and in the "Publications" section of the Ministry of the Environment website at www.ene.gov.on.ca.

4. Questions regarding completion and submission of this data form should be directed to the Environmental Assessment and Approvals Branch, 2 St. Clair Avenue West, Floor 12A, Toronto, Ontario, M4V 1L5, 1-800-461-6290 or (416) 314-8001, or to your local District Office of the Ministry of the Environment.

INFORMATION FOR PROPONENTS APPLYING FOR A CERTIFICATE OF APPROVAL FOR WATER AND SEWAGE WORKS

Section 53 of the *Ontario Water Resources Act* and Part V of the Safe *Drinking Water Act* require that anyone who establishes, alters, extends or replaces new or existing water or sewage works shall do so only in accordance with approval granted by the Director. As a result, any plans to change watermains, storm sewers, sanitary sewers, or combined sewers must first be granted a Certificate of Approval (works which are exempt from Certificate of Approval requirements are detailed in Ontario Regulation 525/98). Detailed information on approval requirements and procedures is contained in separate documents entitled "Guide for Applying for Approval of Municipal and Private Water and Sewage Works (Section 53 *Ontario Water Resources Act*)" and "Guide For Applying For Approvals Related To Municipal And Non-Municipal Drinking-Water-Systems – Parts V and VI of the *Safe Drinking Water Act* and Drinking-Water Systems Regulation". These documents are available on the Ministry of the Environment's website (www.ene.gov.on.ca) or can be obtained by contacting a client services representative at (413) 314-8001.

CRITERIA FOR APPROVAL – WATER AND SEWAGE WORKS

The anticipated environmental impacts of water and sewage works are land and water contamination, or overflow causing physical damage, or resulting in adverse effect. Generally, these impacts can be minimized by appropriate design, installation, operation and maintenance of the water and sewage pipes. There are a number of assessment criteria, which will be explained in this data form, and which can be read in greater detail in the following guidelines, as updated from time to time:

- Guidelines for the design of water distribution systems, Ministry of the Environment, 1985
- Guidelines for the design of sanitary sewage systems, Ministry of the Environment, 1985
- Interim guidelines for the design of storm sewer systems, Ministry of the Environment, 1985
- Procedure for the Determination of Treatment Requirements for Municipal and Private Combined and Partially Separated Sewer Systems (Procedure F-5-5)
- Procedures to govern separation of sewers and watermains (Procedure F-6-1)

1.0 GENERAL PROJECT INFORMATION

1.1 Site Name: ACME Developments Subdivision

1.2 Municipality: City of Anytown

Client (if different from Municipality): ACME Developments

1.3 Type of Works Project (please check all that apply)

- [X] Watermain — *Please complete Sections 1.0 to 5.0 of this form*
- [X] Storm Sewer — *Please complete Sections 1.0 to 4.0, 6.0 and Appendix A of this form*
- [X] Sanitary Sewer — *Please complete Sections 1.0 to 4.0, 7.0 and Appendix B of this form*
- [ ] Forcemain — *Please complete Sections 1.0 to 4.0, 8.0 and Appendix C of this form*

1.4 (a) Project Purpose (please check all that apply)

- [ ] Replacement
- [ ] Increased demand
- [ ] Connecting existing lines
- [X] New development
- [ ] Other: _____

2.0 ENVIRONMENTAL ASSESSMENT ACT REQUIREMENTS

2.1 Is this a private sector project?

- [X] Yes
- [ ] No

If 'No' and not an MEA Class EA Schedule C Residential underdaking, please complete 2.2 and 2.3.

2.2 (a) Choose applicable Municipal sector Class EA Schedule

- [ ] Schedule A
- [ ] Schedule B
- [ ] Schedule C

(b) From the appropriate Schedule identified in 2.2(a), please identify Project Type and associated Schedule/Paragraph No. which applies to the proposed project

- [ ] Water Project
- [ ] Wastewater Project

Schedule No. * See Note

For 'Schedule B' please complete 2.3(a),(b) *For 'Schedule C', please complete 2.3(a),(b),(c)*

2.3 (a) Has a Notice of Completion been submitted along with this application?

- [ ] Yes
- [ ] No

(b) Were any Part II Orders (ie. "Bump-up" requests) received for this project?

- [ ] Yes
- [ ] No

If 'Yes', please provide details: N/A

(c) Has an Environmental Study Report (ESR) been completed?

- [ ] Yes
- [ ] No

If 'Yes', please include ESR Cover page with this submission

* NOTE: This section must be completed, otherwise the file may be delayed pending MOE receipt of this information

3.0 DRAWINGS

NOTE: All drawings must include an accurate scale and be stamped by a Professional engineer. If the drawing is of a large scale where small separation distances cannot be easily measured, these distances must be marked on the drawing or noted as a typical separation.

Have the following details been included with this submission?

☒ *Site Plan, including*
- ☒ Proposed works
- ☒ Existing works (as appropriate)
- ☒ Property lines/Municipal boundaries
- ☒ Any water bodies in proximity to the works

☒ *Plan and Profile of all Pipes*
- ☒ Horizontal distance between watermains and sewers
- ☒ Vertical distance between watermains and sewers
- ☒ Length, diameter and slope of each pipe segment
- ☒ Locations of valves, valve chambers if > 300mm diametre, pressure reducers, tees, etc
- ☒ Location of manholes (and their respective IDs)

☒ *Storm Drainage Area*
- ☒ Indicate all areas which drain into the proposed works
- ☒ Physical area in hectares
- ☒ Runoff Coefficient for each drainage area
- ☒ Storm water drainage path

☒ *Sanitary Drainage Area*
- ☒ Indicate all areas which drain into the proposed works
- ☒ Physical area in hectares
- ☒ Population for each drainage area
- ☒ Sanitary Sewer drainage path

☒ *Other Details*
- ☒ Typical separations, where not easily measured from pipe drawings
- ☒ Appertunances
- ☒ Municipal drains

4.0 ADDITIONAL INFORMATION

4.1 Are the proposed works laid below the frost penetration depth for the area at all points?

☒ Yes ☐ No

4.2 (a) Are all existing and proposed watermains separated by at least 2.5 m of clear horizontal distance from all existing and proposed sewers and storm water conveyance systems (ie. ditches)?

☒ Yes ☐ No

(b) Are all existing and proposed watermains separated by at least 0.5 m of clear vertical distance higher than all existing and proposed sewers and storm water conveyance systems (ie. ditches)?

☒ Yes ☐ No

(c) Are all existing and proposed sewers, including all drains and similar sources of contamination, separated by at least 15 metres from potable water reservoirs below normal ground surface and well supplies?

☒ Yes ☐ No

If 'No' to any part of Question 4.0, please refer to Procedure F-6-1 for solutions to prevent contamination when separation distances cannot be met

5.0 WATERMAINS

For Questions 5.1 to 5.3, please attach an additional sheet if necessary

5.1 Description of Proposed Watermain(s) (including service area/development)

Proposed watermain distribution network for subdivision development

5.2 Description of Existing Works (in proximity to proposed works)

Proposed network will connect into 2 existing watermains

5.3 For each watermain, please provide the following details in the chart below (or equivalent)

STREET	FROM (street/manhole)	TO (street/manhole)	DIAMETER (mm)	ROUGHNESS
- see application				

5.4 Are all of the watermains a minimum of 150 mm in diameter?

☒ Yes ☐ No

5.5 What is the expected operating pressure range for this watermain under maximum day demand?

50 to 65 psi *(please indicate units)*

5.6 (a) Will the watermain pressure drop below 275 kPa (40 psi)?

☐ Yes ☒ No

If 'Yes', please provide an explanation for this situation and future plans to address the problem:

(b) Is there sufficient pressure (138 kPA or 20 psi) reserved for fire flow/protection?

☒ Yes ☐ No

5.7 If this is a feedermain or a pipe dedicated to transporting potable water only (ie. having no service connections), have hydraulic transients been considered?

☐ Yes ☒ No

If 'Yes', please describe the results:

5.8 (a) Are there any dead end points in the system?

☒ Yes ☐ No *If 'Yes', then please complete 5.8(b)*

(b) How will water stagnation be addressed?

☐ Fire Hydrants ☐ Blow-off point ☒ Other Looping

5.9 (a) Are there any tee- or cross-connections?

☒ Yes ☐ No *If 'Yes', then please complete 5.9(b)*

(b) Are there at least two (2) shut-off valves at each tee-connection, and at least three (3) shut-off valves at each cross-connection?

☒ Yes ☐ No

If 'No', how will disruptions to the system be minimized during repairs or emergencies?

6.0 STORM SEWERS

For Questions 6.1 to 6.3, please attach an additional sheet if necessary

6.1 Description of Proposed Storm Sewer(s) (including service area/development)

- proposed storm sewers for subdivision development

6.2 Is this application for approval a part of a larger and/or phased development?

☐ Yes ☒ No

If 'Yes', please provide full details on any existing developments including all Certificates of Approval that have been approved or application that are currently under review. Clearly indicate in all stamped engineering drawings and reports which developments belong to which phase and whether they are existing, for current development, or for future development.

(please attach another sheet if necessary)

6.3 Description of Existing Works (in proximity to proposed works)

- outlet will be to municipal sewer then to existing municipal ditch

6.4 For each storm sewer, please provide the following details in the chart below (or equivalent)

STREET	FROM (street/manhole)	TO (street/manhole)	DIAMETER (mm)	ROUGHNESS
- see application				

6.5 Has the Storm Sewer Hydraulic Design Sheet (or equivalent) been included with this submission? (refer to the Guidance Document in Appendix A)

☒ Yes ☐ No

6.6 Please indicate which land use surface types are included in the drainage area and list the runoff coefficient(s) used for each type

	SURFACE TYPE	RECOMMENDED	USED
☐	Asphalt, concrete, roof areas	0.90 - 1.00	
☐	Gravel	0.80 - 0.85	
☐	Grassed areas, parkland	0.15 - 0.35	
☒	Commercial	0.75 - 0.85	0.80
☐	Industrial	0.65 - 0.75	
☒	Single family dwelling	0.40 - 0.45	0.40
☐	Semidetached	0.45 - 0.60	
☐	Row housing, Townhousing	0.50 - 0.70	
☐	Apartments	0.60 - 0.75	
☐	Institutional	0.40 - 0.75	
☐	Other		

If **USED** *runoff coefficient does not fall within the* **RECOMMENDED** *range, please provide rationale below:*

6.7 (a) What is the full flow velocity range for all storm sewers in the proposed works?

0.87 to 2.74 m/s

(b) If the full flow velocity is outside of the range of 0.8 m/s to 6.0 m/s, what measures will be employed to reduce sediment build up and/or erosion in the pipe?

6.8 (a) What is the municipality's requirement for the minor design storm event?

☐ 2 year ☒ 5 year ☐ 10 year ☐ Other _____

(b) What storm event has been used for the design of the proposed works?

☐ 2 year ☒ 5 year ☐ 10 year ☐ Other _____

(c) Are there any inlet control devices (ICDs) proposed in the catch basins?

☐ Yes ☒ No

6.9 Please indicate the first destination/location that will be receiving the storm water:

☐ Natural Water Body Name: _____

Has the Conservation Authority granted approval to discharge to this water body?

☐ Yes ☐ No

☒ Storm Water Management (SWM) Facility Name: * See Note

Certificate of Approval No. (if applicable): N/A proposed facility OR,

Application Reference No. (if submitted): _____

Has the Operating Authority (of the SWM facility) granted approval to discharge to this facility?

☐ Yes ☐ No

☐ Municipal Drain

☐ Existing Sewers

Note: **Please be advised SWM facilities must be approved and constructed either at the same time or PRIOR to construction of Sewers and Watermains. Applications will be rejected otherwise, with few exceptions.*

7.0 SANITARY SEWERS

For Questions 7.1 to 7.3, please attach an additional sheet if necessary

7.1 Description of Proposed Sanitary Sewer(s) (including service area/development)

- sanitary sewers for subdivision development

7.2 Description of Existing Works (in proximity to proposed works)

- sewers will connect to existing 500 mm collection sewer which crosses development area

7.3 For each sewer, please provide the following details in the chart below (or equivalent)

STREET	FROM (street/manhole)	TO (street/manhole)	DIAMETER (mm)	ROUGHNESS
- see application				

7.4 Has the Sanitary Sewer Design Sheet (or equivalent) been included with this submission? (refer to Guidance Document in Appendix B)

☒ Yes ☐ No

7.5 Please indicate which sewage types are applicable in the drainage area and list the daily design flows used in the pipe design for each type

	SEWAGE TYPE	RECOMMENDED	USED
☒	Domestic	225 - 450 L/cap/day	350 L/ha/day
☐	Hospitals	900 - 1800 L/bed/day	
☒	Schools	70 - 140 L/student/day	35,000 L/ha/day
☐	Trailer Parks	340 - 800 L/space/day	
☒	Infiltration	0.1 - 0.28 L/ha/s	0.28 L/ha/s
☐	Industrial	35 - 55 m3/ha/day	
☐	Shopping Centres	2500 - 5000 L/1000 m2/day	
☐	Hotels/Motels	150 - 225 L/bed space/day	
☒	Other	Commercial	35,000 L/ha/day

If **USED** *sewage daily design flow does not fall within the* **RECOMMENDED** *range, please provide rationale below:*

7.6 (a) What is the full flow velocity range for all sanitary sewers in the proposed works?

0.66 to 2.24 m/s

(b) If the full flow velocity is outside of the range of 0.6 m/s to 3.0 m/s, what measures will be employed to reduce sewage build up and/or erosion in the pipe?

7.7 It is recommended that sanitary sewers be laid at sufficient depth to receive gravity flow from basements. Are any sanitary sewers above the depth of any basements in the area?

☐ Yes ☒ No

If 'Yes', what methods will be employed to prevent sewage backup into basements?

ATTACHMENT 10
SITE SERVICING DESIGN REPORT

ACME DEVELOPMENTS SUBDIVISION

Site Servicing Design Report

Submitted to:
ACME Development Inc.
123 Anywhere Street
Anytown, Ontario
N9N 1A1

REPORT

Distribution:

2 copies	–	Acme Development Inc., Anytown, Ontario
2 copies	–	Ministry of the Environment, EAAB, Toronto, Ontario
1 copy	–	Ministry of the Environment, Othertown District Office
2 copies	–	Consulting Ltd., Anytown, Ontario

VERSION CONTROL

Rev.	Date	Revision Description	Reviewer Initials

Table of Contents

TABLES

FIGURES

APPENDICES

Appendix A: Water Distribution Calculations

- Water Distribution Modelling Plan, DWG. 08-0108-WD1

Appendix B: Sanitary Sewer Calculations (Data Sheets)

- Sanitary Drainage Area Plan, DWG. 08-0108-SA1

Appendix C: Storm Sewer Calculations (Data Sheets)

- Storm Drainage Area Plan, DWG. 08-0108-ST1

Appendix D: Stormwater Management Calculations

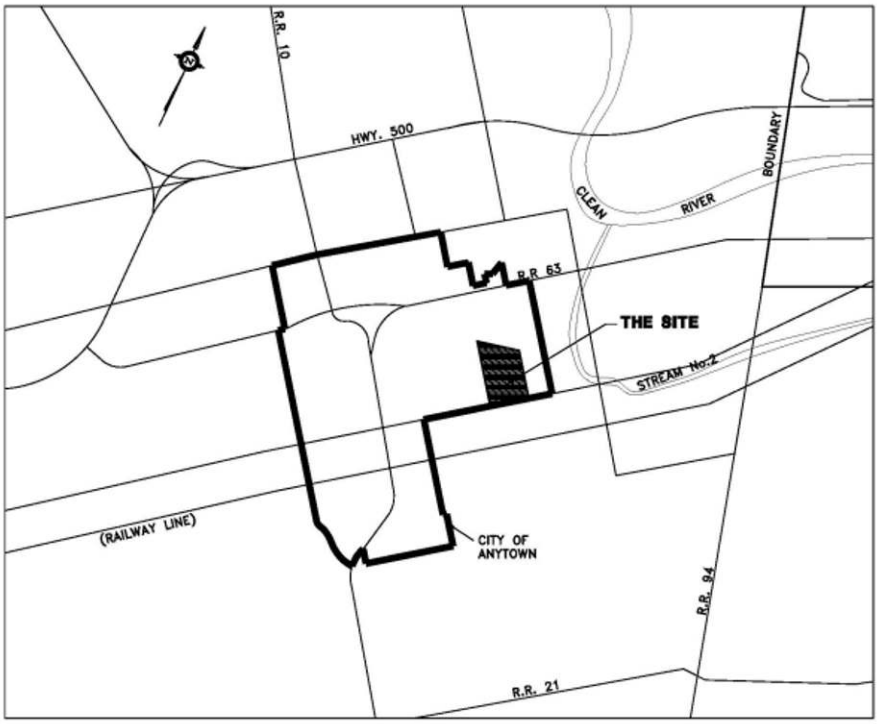
- Pre-Development Drainage Plan, DWG. 08-0108-SP1
  (Showing area hectarages and imperviousness values)
- Post-Development Drainage Plan, DWG. 08-0108-SP2
  (Showing area hectarages and imperviousness values)
- Stormwater Management Plan, DWG. 08-0108-SWMP (Showing overall site, neighbouring properties, 100-year flood line, water wells, major flow route and receiver location)
- Stormwater Management Facility Plan, DWG. 08-0108-SWMF1
- Stormwater Management Facility Details, DWG. 08-0108-SWMF2

1.0 INTRODUCTION

This Site Servicing Design Report is prepared in support of the proposed development of ACME Development Subdivision in the City of Anytown. The subdivision received draft plan approval on July 21, 2007 (File 06T-06010).

The proposed subdivision is located on Lot 27, Concession 11, City of Anytown, Prosperous County, as shown in Figure 1: Key Plan. The entire property is approximately 44.7 ha, including an external drainage area at the north, contributing storm flow from an approximately 10 ha existing development area. The proposed development will include single family lots, a school property, commercial areas, a business employment area and open space. The development is proposed to be constructed in two phases. Detailed design of the roads and lot grading have only been completed for the first phase, however the servicing designs have been completed for both phases at this time.

Figure 1: Key Plan



2.0 SITE DESCRIPTION

The site is generally flat lying and is predominately grass covered with some scattered tree and bush coverage. Based on the results of a geotechnical investigation by others, the subsurface conditions within the proposed development are quite variable but are expected to consist of layered silts and clays overlying glacial till which in turn overlies bedrock. Published geologic maps indicate that bedrock in the vicinity of the site consists of limestone of the Gull River formation.

Topsoil exists at ground surface or underlying the fill material at all of the boreholes and ranges in thickness from approximately 150 to 240 mm. Layered clayey silt and sandy silt exists underlying the topsoil at all the borehole locations. This layered deposit was fully penetrated and ranges from approximately 1.2 to 1.7 m in thickness. A deposit of glacial till underlies the sandy silt or layered clayey silt/sandy silt at all the borehole locations. The glacial till consists of a heterogeneous mixture of gravel, cobbles, and boulders in a matrix of sandy silt with a trace of some clay. Practical refusal to augering was encountered at some boreholes at depths of approximately 2.1 to 4.7 m below the existing ground surface. Auger refusal may indicate the bedrock surface, however, it could also represent cobbles and/or boulders within the glacial till.

The groundwater conditions were observed in the boreholes during the short time they remained open. Groundwater levels were observed to range from being at the existing ground surface to some where no groundwater inflow was observed. It should be noted that groundwater levels are expected to fluctuate seasonally. Higher groundwater levels are expected during wet periods of the year, such as spring.

The excavation for site services will extend through topsoil, sandy silt/clayey silt, glacial till, as well as into the bedrock in some locations. No unusual problems are anticipated in excavating the overburden using conventional hydraulic excavating equipment, recognizing that boulders may be encountered within the glacial till. Boulders larger than 0.3 metres in size should be removed from the excavation side slopes.

The Occupational Health and Safety Act (OHSA) of Ontario indicates that side slopes in the overburden above the water table should be sloped at a minimum of 1 horizontal to 1 vertical (i.e., Type 3 soils). If the water table is encountered within the layered silty soils, the side slopes would have to be shallower to prevent sloughing and side slope inclinations of 3 horizontal to 1 vertical may be required (i.e., Type 4 soils). Alternatively, the excavations for site services could be carried out within a fully braced, steel trench box.

Some groundwater inflow into the trenches should be expected. However, it should be possible to handle the groundwater inflow by pumping from well filtered sumps in the excavations.

It is expected that the bedrock removal for this project will be carried out using drill and blast techniques. Mechanical methods of rock removal (such as hoe ramming) can likely be carried out for depths of about one metre, however, this work would likely be slow and tedious. Near vertical trench walls in the bedrock should stand unsupported for the construction period.

At least 150 mm of OPSS Granular A should be used as pipe bedding for sewer and water pipes. The bedding material should extend to the spring line of the pipe and should be compacted to at least 95 percent of the standard Proctor maximum dry density using suitable vibratory compaction equipment. Cover material, from spring line of the pipe to at least 300 mm above the top of pipe, should consist of OPSS Granular A or Granular B Type I with a maximum particle size of 25 mm. It should generally be possible to re-use the glacial till, weathered silty clay, and silty soils as trench backfill. Where the trench will be covered with hard surfaced areas, the type of native material placed in the frost zone (between subgrade level and 1.8 m depth) should match the soil exposed on the trench walls for frost heave compatibility. Trench backfill should be placed in maximum 300 mm thick lifts and should be compacted to at least 95 percent using suitable compaction equipment.

3.0 EXISTING SERVICES

The site is presently served by existing watermains on Ninth Drive (300 mm diameter) and Gorde Street (400 mm diameter). An existing 500 mm diameter sanitary collector sewer also passes through the subdivision and connects to the Anytown trunk sewer. These services have sufficient capacity to serve the proposed development.

Runoff from the development area currently flows across Fill Road into an existing municipal ditch, which then flows into Stream No. 2 then into the Clean River, as shown on Stormwater Management Plan DWG. 08-0108-SWMP (Appendix D). Stormwater from the development will be collected and treated in accordance with the Anytown Master Drainage Plan such that the final outflow will meet Ministry of the Environment (MOE) and Clean River Conservation Authority (CRCA) requirements. An end of pipe wet pond is proposed for quality and quantity control, in conjunction with lot level controls and best management practices to provide protection of downstream watercourses. The proposed stormwater management facility will be constructed concurrently with servicing of the development.

The site has an existing groundwater well which used to serve a barn and is slated for demolition. There are existing similar wells in neighbouring properties, approximately 200 m distance from the site boundary. One of the wells belongs to the Ministry of Environment. The wells are reportedly in use and are being monitored.

The land to the north of the developed is planned for a future single-family detached residential development. The property immediately adjacent on the east is a light industrial park development but the properties adjacent to the development have not yet been developed. Further to the east is existing agricultural land. To the south is the existing railway line and land for light industrial development. The land to the west is an existing residential development.

4.0 PROPOSED SERVICING

4.1 Water Distribution Design

An existing 300 mm diameter watermain is located in Ninth Drive, while a 400 mm diameter watermain is located in Gorde Street with approximately 300 kPa residual pressure at the location near to the site connection. The proposed development will be connected into both systems to create a loop

The proposed watermains are PVC DR 18, Class 150 and range in size from 150 mm to 300 mm.

Design capacities have been assessed based on the Anytown Water Master Plan requirements including average daily demands of 310 L/c • day, maximum day of 1,085 L/c • day, and peak hour of 1,650 L/c • day. Population densities of 3.8 persons per unit have been assumed. Minimum fire flows of 6,600 L/min (110 L/s) have been assumed. Detailed analysis and calculations for the water distribution system are included in Appendix A.

4.2 Sanitary Design

The Anytown trunk sewer, which runs adjacent to the south property line, will provide the outlet for all sanitary sewage flows from the property. An existing collector sewer (500 mm) passes through the property, serving lands to the north of the property as well, and connects to this trunk sewer. The road configuration has taken into account this collector sewer so that it falls within the Fifth Road road allowance.

As part of the approval of the original subdivision for the industrial park area, sewage capacity in the trunk sewer was committed for the calculated sewage flows for the total area. Although the trunk sewer capacity is now almost completely committed to existing or proposed development in Anytown, the ACME Development portion is included.

250 mm PVC sanitary sewer mains are proposed throughout the development with a minimum pipe full velocity of 0.6 m/s. Residential design parameters for the site include 350 L/cap/day and residential densities of 3.8 persons per unit. The commercial and institutional areas have been included at 35,000 L/ha/day. The sanitary flows also include an infiltration allowance of 0.28 L/s/ha.

Detailed flow calculations are included in Appendix B, as is the Sanitary Drainage Area Plan, which confirm that the existing sanitary sewers have adequate capacity to convey site sewage flows to the Anytown Treatment Plant.

4.3 Storm Sewer Design

Stormwater will be conveyed through a curb and gutter system that will direct surface water flows into catchbasins and manholes and into the storm sewer system. The pipe network is designed to accommodate the 1:5 year storm event flows. Storms in excess of this event could result in surcharging of the sewer system. Conveyance during a major runoff event will be overland along roadways and swales towards the stormwater management facility.

Detailed storm sewer calculations are included in Appendix C, as is the Storm Drainage Area Plan.

Stormwater from the development will be collected and treated in accordance with the Anytown Master Drainage Plan such that the final outflow will meet MOE, CRCA, and City of Anytown requirements. A stormwater management facility will be constructed to provide end of pipe quality and quantity control. This facility, in conjunction with lot level controls, and sedimentation and erosion control practices during construction, will provide protection of downstream watercourses. Further stormwater management details are provided in Section 5 of this report.

5.0 STORMWATER MANAGEMENT

5.1 Stormwater Management Requirements

Regulatory agencies were consulted at the pre-design stage to determine the requirements for managing stormwater from ACME Development Subdivision. These agencies included the City of Anytown, CRCA and the MOE. The following list summarizes the principal stormwater issues considered in the design:

- Maintain the existing subdrainage areas as much as possible.
- Minimize impacts from development on Clean River, provide Normal protection (70% TSS removal).
- Address erosion and/or flooding issues associated with increased peak flow rates after development.
- Select lot level, conveyance, and end of pipe controls where practical in order to minimize changes to the hydrologic cycle and to maintain perennial baseflows.
- Address operations and maintenance issues.
- Develop an erosion and sediment control plan (ESCP) for use during construction.

5.2 Drainage Areas

The overall pre-development drainage area is approximately 69.75 ha, as shown on the Pre-Development Drainage Plan, DWG. 08-0108-SP1 (Appendix D). This includes the actual subdivision lands and the external additional adjacent lands which drain to the same outlet location. No other flows from adjacent lands are proposed to enter the stormwater management facility and would require appropriate enlargement or by-passing of the facility should this be contemplated in the future. Subdrainage areas are shown on the Post-Development Drainage Plan DWG. 08-0108-SP2. The majority of runoff from the subdivision presently drains to an existing ditch located on land east of the site. A small portion of the site also drains to Any Creek located north-west of the subdivision.

After development, the existing drainage patterns will be maintained as much as possible with the majority of runoff directed to a proposed wet pond and the existing ditch east of the site.

In consultation with the CRCA and the City of Anytown, it was agreed that runoff from grassed areas could be directed to Any Creek. This runoff will be sheetflow in order to maximize infiltration and minimize changes in peak flows. No temperature impact is anticipated since stormwater detention facilities are not proposed for this drainage area and no new stormwater from hard surfaces will be directed to Any Creek after development.

5.3 Pre-Development Conditions

5.3.1 Rainfall Data

Synthetic rainfall hyetographs were derived using the 4-hour and 24-hour Chicago distributions of published City of Anytown Intensity Duration Frequency (IDF) data, and the 12-hour and 24-hour Soil Conservation Service (SCS) distributions of published Ontario Ministry of Transportation (MTO) IDF data.

The 24-hour Chicago distribution was selected based on recommendations in the Anytown Master Drainage Plan that this storm event provides a “worst case” scenario. The 4-hour Chicago distribution and the SCS distributions were also simulated, as requested by the CRCA, to evaluate the operation of the stormwater system under various design rainfall scenarios.

5.3.2 Watershed Data

The overall pre-development drainage area is approximately 69.75 ha for the proposed development. Refer to the Pre-Development Drainage Plan, DWG. 08-0108-SP1, located in Appendix D.

Based on information provided in the Anytown Master Drainage Plan, a pre-development SCS Curve Number (CN) of 77 was selected for this area. The principal hydrologic parameters for pre-development areas are summarized in Table 1.

A time of concentration (Tc) of 96 minutes was estimated by the SCS Upland Method for this drainage area. This method is applicable to drainage basins up to 10 square kilometres, and applies to overland flow and flow in gullies and grassed waterways[1]. The time of concentration calculated above was checked for reasonableness with other methods. Sample calculations for times of concentration are presented in Appendix 'D'.

[1] RTAC Drainage Manual, Volume 1, 1982

Table 1: Hydrologic Parameters

Scenario	Sub-Drainage Area	Input				
		Area (Ha)	CN	TP (hrs)	TIMP	SLP (%)
Pre-development	1. Development Area	47.57	77	1.07	N/A	N/A
	2. South-west industrial	4.47	77	0.5	N/A	N/A
	3. North-West Industrial	4.77	77	0.6	N/A	N/A
	4. West Industrial	3.80	77	0.6	N/A	N/A
	5. East Industrial	9.14	77	0.65	N/A	N/A
Post-Development	1. ACME Development (including School	36.65	83	N/A	0.35	0.50
	2. Business Employment	8.09	79	N/A	0.80	0.50
	3. Gorde Street	1.83	92	N/A	0.55	0.40
	4. South-West Industrial	3.27	79	N/A	0.55	0.50
	5. South-West Fill Road	0.69	79	N/A	0.55	0.24
	6. Echo Crescent	1.60	79	N/A	0.35	1.25
	7. North-West Industrial	3.46	79	N/A	0.55	0.50
	8. North-West Fill Road	2.59	92	N/A	0.55	0.20
	9. West Industrial	2.53	79	N/A	0.55	0.50
	10. East Fill Road	2.22	92	N/A	0.55	0.20
	11. East Industrial	6.60	79	N/A	0.55	0.50
	Outlet	69.53				

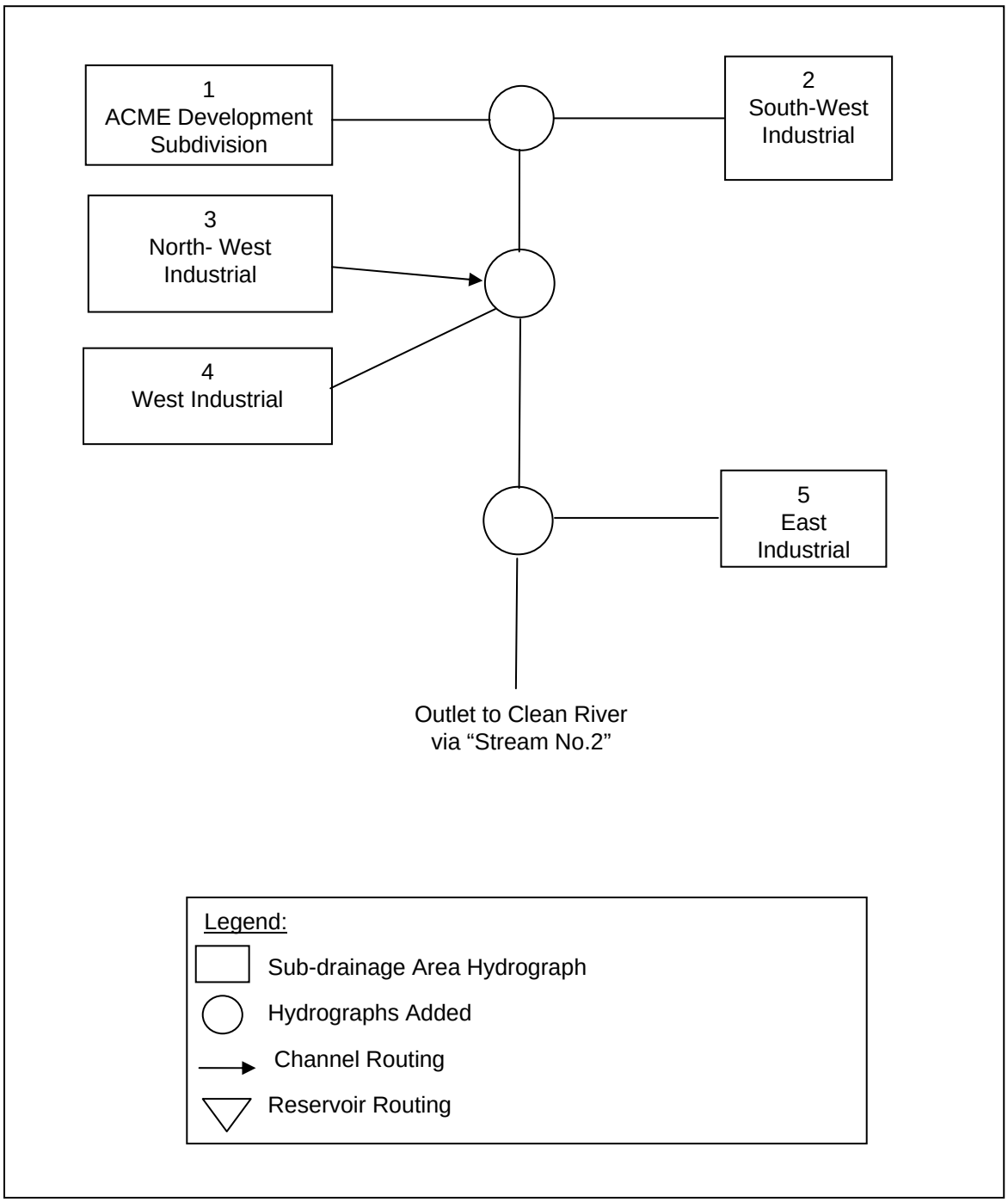
Notes: 1 Pre-Development sub-drainage areas 2-5 are included in the overall area but are also shown separately for comparison.
2 A SCS Curve Number (CN) of 77 was selected for pre-development conditions based on information provided in the City of Anytown Master Drainage Plan and existing soils information.
3 Refer to *OTTHYMO* input and output files for detailed information.
4 Refer to the Pre-Development Drainage Plan, Post Development Drainage Plan, and Schematization of *OTTHYMO* Model (figure 2).
5 The time to peak (TP) of the unit hydrograph derived by the *OTTHYMO* model was calculated to be 1.07 hr (0.67 x T_c).

5.3.3 Hydrograph Generation

The *OTTHYMO* computer model was used to generate hydrographs and calculate peak flow rates for 5-year and 100-year Chicago and SCS design storms. The "NASHYD" command was selected to generate the pre-development hydrographs. A schematization of the *OTTHYMO* model used to assess the pre-development runoff is presented in Figure 2.

The peak runoff rates from the rainfall events are summarized in Table 3. Detailed *OTTHYMO* data and output files are not included in this report, but can be provided if required.

Figure 2: Schematization of OTTHYMO Model Pre-Development Conditions



Notes: 1 Refer to Pre-Development Drainage Plan, DWG.08-0108-SP2

5.4 Post-Development Conditions

5.4.1 Rainfall Data

As with the pre-development conditions, synthetic rainfall hyetographs for post development conditions were generated using the 4-hour and 24-hour Chicago distributions, and the 12-hour and 24-hour SCS distributions.

5.4.2 Watershed Data

The overall post-development drainage area was subdivided into sub-drainage areas according to their hydrologic characteristics, land use, and drainage routing. These sub-drainage areas are shown on the Post-Development Drainage Plan, DWG. 08-0108-SP2, in Appendix D.

The principal hydrologic parameters for the sub-drainage areas are summarized in Table 1. The imperviousness values for developed areas were selected based on experience and with reference to the MTO Drainage Manual. Recommended design percent imperviousness values for urban areas are summarized in Table 2.

Table 2: Percent Imperviousness of Urban Areas

Drainage Area	Urban Land Use Category	Recommended % Imperviousness	% Imperviousness Selected for Design
ACME Development and Echo Crescent Subdivisions	Residential – Medium Density	25 – 40	35
Business Employment Area	Business – Commercial	40 – 90	80
Gorde St., Fill Rd., Ninth Dr.	Industrial – Light	45 - 65	55

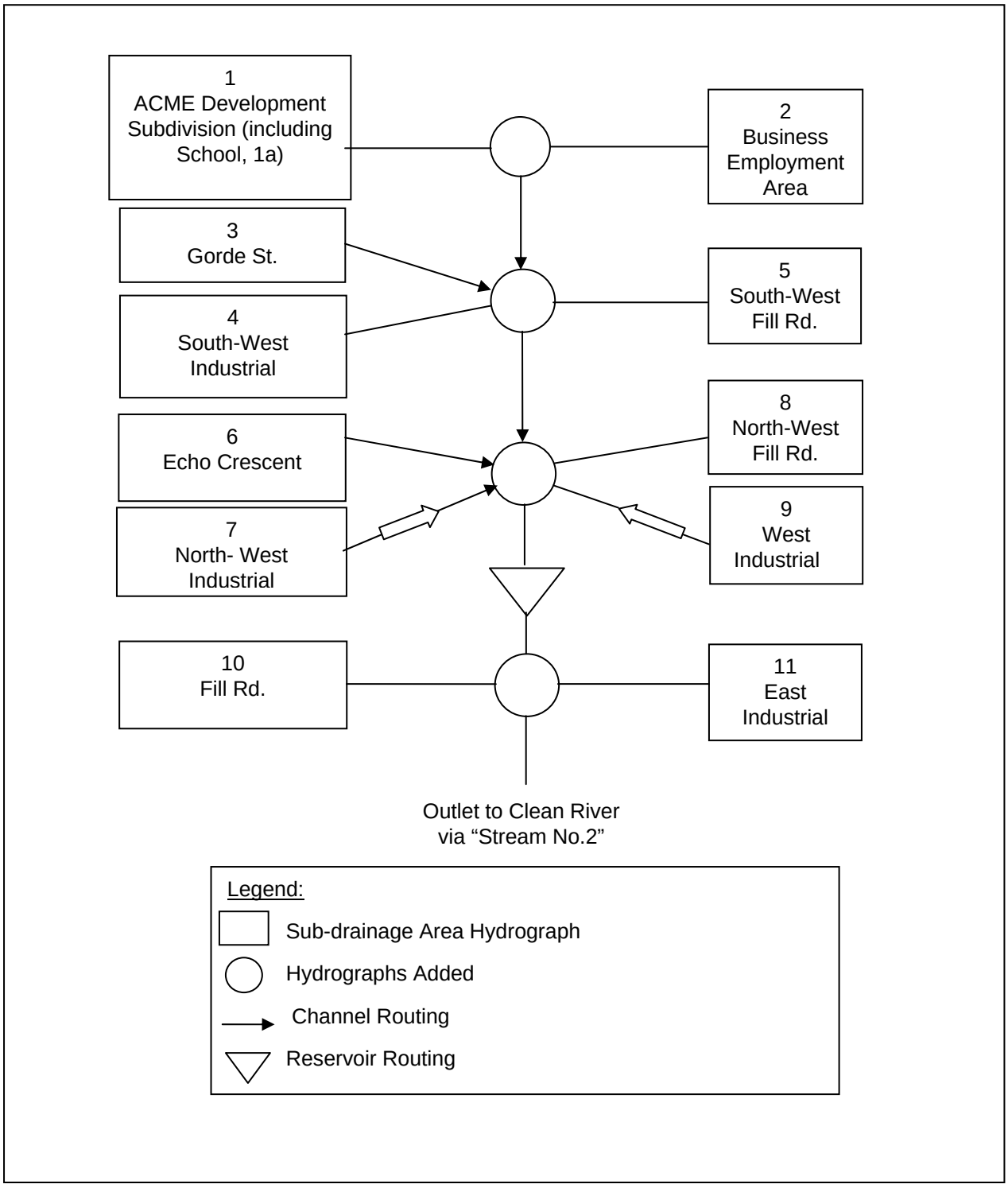
Notes: 1. Recommended imperviousness values are taken from the MTO Drainage Manual, Volume 1, 1984, Chart B2-2.

5.4.3 Hydrograph Generation

The *OTTHYMO* computer model was used to generate hydrographs and calculate peak flow rates for the 2-year, 5-year and 100-year rainfall events. Separate hydrographs were generated for each of the subdrainage areas; and, once generated, these hydrographs were added, routed along sewers and ditches and routed through the stormwater management pond, as required, to determine a hydrograph for the overall post-development drainage area. A schematization of the *OTTHYMO* model used to assess the post-development runoff is presented in Figure 3. The peak runoff rates from the rainfall events are summarized in Table 3.

The “STANDHYD” command was used to generate hydrographs from all developed areas. Since the City of Anytown will require runoff from future development of industrial properties to be controlled to levels based on a runoff coefficient of 0.20, a curve number of 79 was used and simulated stormwater quantity control ponds, to reduce peak flows to estimated allowable levels, were used by the model for industrial areas.

Figure 2: Schematization of OTTHYMO Model Post-Development Conditions



Notes: 1 Refer to Post-Development Drainage Plan, DWG.08-0108-SP3

Table 3: Estimated Flow Rates

		Output															
		4 Hour Chicago Storm				24 Hour Chicago Storm				12 Hour SCS Storm				24 Hour SCS Storm			
		5-Year		100-Year		5-Year		100-Year		5-Year		100-Year		5-Year		100-Year	
Scenario	Sub-Drainage Area	Peak Flow (m3/s)	Calculated Runoff Coefficient	Peak Flow (m3/s)	Calculated Runoff Coefficient	Peak Flow (m3/s)	Calculated Runoff Coefficient	Peak Flow (m3/s)	Calculated Runoff Coefficient	Peak Flow (m3/s)	Calculated Runoff Coefficient	Peak Flow (m3/s)	Calculated Runoff Coefficient	Peak Flow (m3/s)	Calculated Runoff Coefficient	Peak Flow (m3/s)	Calculated Runoff Coefficient
Pre-Development	1. Overall	**0.905**	0.31	**2.053**	0.42	**1.085**	0.38	**2.149**	0.44	**1.089**	0.37	**2.009**	0.46	**1.158**	0.40	**2.372**	0.520
	2.South-West Industrial	0.075	0.28	0.174	0.39	0.091	0.34	0.183	0.43	0.089	0.37	0.165	0.46	0.095	0.40	0.195	0.520
	3. North-West Industrial	0.070	0.31	0.161	0.42	0.083	0.38	0.168	0.44	0.082	0.37	0.152	0.46	0.087	0.40	0.178	0.520
	4. West Industrial	0.051	0.31	0.117	0.42	0.061	0.38	0.123	0.44	0.060	0.37	0.111	0.46	0.064	0.40	0.130	0.520
	5. East Industrial	0.125	0.31	0.289	0.42	0.151	0.38	0.303	0.44	0.150	0.37	0.277	0.28	0.159	0.40	0.325	0.520
Post-Development	1. ACME Development (including School)	1.523	0.49	2.869	0.58	1.619	0.54	2.940	0.59	1.364	0.53	2.509	0.61	1.370	0.56	2.824	0.660
	2. Business Employment	1.450	0.85	2.431	0.87	1.454	0.86	2.434	0.88	1.050	0.86	1.590	0.88	1.012	0.87	1.695	0.900
	3. Gorde Street	0.260	0.68	0.414	0.73	0.263	0.71	0.416	0.74	0.182	0.71	0.282	0.75	0.178	0.72	0.299	0.780
	4. South-West Industrial (controlled)	0.074	0.68	0.173	0.73	0.091	0.71	0.183	0.74	0.089	0.71	0.165	0.75	0.095	0.72	0.195	0.780
	5. South-West Fill Road	0.100	0.68	0.159	0.73	0.101	0.71	0.160	0.74	0.069	0.71	0.106	0.75	0.067	0.72	0.112	0.780
	6. Echo Crescent	0.043	0.42	0.202	0.53	0.100	0.49	0.121	0.55	0.088	0.48	0.105	0.56	0.091	0.52	0.202	
	7. North-West Industrial (controlled)	0.069	0.68	0.159	0.73	0.083	0.71	0.167	0.74	0.340	0.71	0.150	0.75	0.086	0.72	0.176	0.780
	8. North-West Fill Road	0.342	0.68	0.550	0.73	0.344	0.71	0.551	0.74	0.239	0.71	0.373	0.75	0.232	0.72	0.398	0.780
	9. West Industrial (controlled)	0.050	0.68	0.115	0.73	0.060	0.71	0.122	0.74	0.252	0.71	0.110	0.75	0.064	0.72	0.419	0.780
	SWM Pond	3.603	N/A	6.227	N/A	3.736	N/A	6.342	N/A	2.970	N/A	4.992	N/A	2.943	N/A	5.472	N/A
	SWM Pond Outlet	0.755	N/A	1.548	N/A	0.893	N/A	1.609	N/A	0.898	N/A	1.527	N/A	0.949	N/A	1.729	N/A
	10. East Fill Road	0.297	0.68	0.476	0.73	0.299	0.71	0.477	0.74	0.207	0.71	0.322	0.75	0.200	0.72	0.343	0.780
	11. East Industrial (controlled)	0.124	0.68	0.288	0.73	0.150	0.71	0.303	0.74	0.150	0.71	0.274	0.75	0.159	0.72	0.323	0.780
	Outlet	**0.893**	N/A	**1.848**	N/A	**1.057**	N/A	**1.923**	N/A	**1.060**	N/A	**1.810**	N/A	**1.122**	N/A	**2.051**	N/A
SWM Pond	SWM Pond Detention Volume (m3)	6802		12750		7828		13320		7792		12570		8153		14260	
	Max. SWM Pond Water Level (m)	103.19		103.69		103.27		103.73		103.28		103.68		103.31		103.81	

Notes: 1 Calculations performed by *OTTHYMO* hydrologic model.

2 Calculations are based on hyetographs derived using Chicago distribution of Anytown IDF data and SCS distribution of published MTO IDF data.

3 Pre-development runoff rates were assumed for industrial land since the City of Anytown requires that runoff from this land be controlled to pre-development rates after development.

4 Refer to the Pre-Development Drainage Plan, Post-Development Drainage Plan, and schematization of *OTTHYMO* Model.

5.5 Stormwater Management Controls and Best Management Practices

The stormwater management facilities proposed for this development were designed in accordance with the MOE Stormwater Management Planning and Design (SWMPD) Manual, 2003. Lot level, conveyance, and end of pipe controls were selected wherever practical in order to maximize the effectiveness of the overall system and minimize the impact of development on the natural hydrologic cycle.

5.5.1 Lot Level and Conveyance Controls

Wherever possible, lots were designed using the minimum grade (2%) allowed by the City of Anytown; this minimizes velocities and maximizes the opportunity for filtration and infiltration of runoff from residential lots.

Roof drains from the development will be directed to side and rear yards rather than being directly connected to storm sewers. This will help to reduce peak flows and increase infiltration.

A grass lined drainage swale will be constructed to convey stormwater from rear yards along the east side of the subdivision. This will allow filtration of stormwater, reduce peak flows and promote infiltration.

5.5.2 End of Pipe Facility

An end of pipe facility in the form of a wet pond was selected for the site for the following reasons:

a) The clayey silt would not support long term infiltration techniques including a dry pond.

b) Because of the large site area (i.e. 70 ha), other Best Management Practices, including oil-grit separators, would not have been practical.

c) In the absence of any previous detailed watershed studies for the catchment area, it was the CRCA's opinion that a wet pond would serve the site.

A stormwater management wet pond was designed to provide both quality and quantity control. The pond is designed to provide Normal (70% long-term suspended solids removal) quality control, in accordance with MOE guidelines, and to reduce the peak flow rate after development to pre-development levels for the 5-year and 100-year rainfall events.

5.5.2.1 Stormwater Quantity Control

The stormwater pond is also designed to provide quantity control for storm events larger than the quality design storm. Quantity control is provided by a 1.0 m wide weir at the outlet control structure. This control is designed to reduce the peak flow rate from land west of Fill Road (pond outlet) so that the combined peak flow at the outlet of the industrial property is no greater than the peak flow under existing conditions.

A 2,400 mm x 2,400 mm manhole provides access to the outlet controls for maintenance purposes.

The discharge from this control was calculated by using the broad crested weir equation; these flows were adjusted for submerged conditions, where required, since the weir will be submerged during higher discharge rates. A summary of the storage-discharge relationship for the pond is presented in Table 4.

Table 4: Stage-Storage-Discharge Table for SWM Pond

Depth (m)	Release Rate (m3/s)	Storage Volume (Ha.m)
0.0	0.000	0.0000
0.1	0.025	0.0979
0.2	0.038	0.1984
0.3	0.218	0.3092
0.4	0.393	0.4222
0.5	0.557	0.5374
0.6	0.719	0.6549
0.7	0.875	0.7634
0.8	1.043	0.8808
0.9	1.199	1.0006
1.0	1.351	1.1226
1.1	1.516	1.2470
1.2	1.663	1.3737
1.3	1.826	1.5028

The overall peak runoff rates from the 5-year and 100-year rainfall events after development are shown in Table 3. These flows are lower than the pre-development flow rates discussed in Section 5.3.3.

5.5.2.2 Stormwater Quality Control

Quality control is required for the proposed subdivision, the Business Employment area, and Gorde Street. Due to the nature of the Gorde Street drainage, stormwater treatment will also be provided for runoff from the west half of Fill Road (south of the outlet ditch), and the south-west parcel of industrial land (approximately 50.53 ha total).

5.5.2.2.1 Pond Volumes

The overall impervious level for the site comprising of residential (45%), business (30%) and industrial (25%) areas is estimated to be approximately 55%.

The water quality storage volume requirements for a wet pond providing Normal protection is 110 m^3/ha, assuming a 55% impervious level (refer to Table 3.2 of the SWMPD Manual). This represents 70 m^3/ha for permanent pool and 40 m^3/ha for extended detention storage. The total required storage volumes for this design, assuming 50.53 ha and 55% impervious level, are approximately 3,540 m^3 for the permanent pool and 2,020 m^3 for extended detention.

With a 2.0 m deep permanent pool, the proposed pond provides a permanent pool volume of over 13,000 m^3; the required extended detention volume is provided when the depth in the pond is approximately 0.2 m above the permanent pool level. A sample volume calculation for the stormwater pond is provided in Appendix 'D'; which have been checked by *OTTHYMO* flow calculation event flows for post-development attenuated flows.

5.5.2.2.2 Length to Width Ratio

The stormwater management pond is designed to have a minimum 3:1 length to width ratio for the water quality design storm. Due to the shape of the available land, the sediment forebay and a low flow berm are designed to extend the flow path of minor storms (up to 5-year) entering into the facility. With the low flow berm, the average length of the flowpath is more than 200 m and the width of the pond at the normal water level is no more than 60 m.

5.5.2.2.3 Sediment Forebay

As previously mentioned, a sediment forebay is proposed at the upstream end of the wet pond. This area will improve sediment removal near the sewer inlets from ACME Developments and Gorde Street, and will simplify future maintenance operations. The forebay will include a hard bottomed surface in order to allow vehicular access for maintenance. The proposed surface will be an interlocking stone with openings to allow growth of vegetation.

The forebay is separated from the rest of the pond by an earthen berm. This berm is submerged slightly below the permanent pool at the outlet of the forebay; the berm extends slightly above the extended detention elevations along the length of the forebay in order to direct the flow of stormwater to the forebay outlet and prevent short-circuiting of stormwater. The area of the forebay is less than 33% of the overall pond surface area, as recommended in the MOE SWMPD Manual. Sample calculations used to size the forebay and review the scour potential through the pond are presented in Appendix 'D'.

5.5.2.2.4 Inlet Design and By-Pass

Three inlets to the wet pond are proposed. Quality and quantity control is required for stormwater from two of these inlets (one inlet from ACME Development Subdivision and one inlet from Gorde Street and Fill Road). As such, both of these inlets discharge to a sediment forebay located at the upstream end of the pond. Stormwater quantity control is provided for the other inlet (drainage from Fill Road north of the facility); this inlet is located at the northeast corner of the pond for physical and economic reasons.

All inlets are designed as unsubmerged for the water quality storm with the inverts of the storm sewers at or above the permanent pool elevation. These inlets will become partially or fully submerged during larger design storms (i.e. 5-year to 100-year storms). Backwater effects on storm sewers from ACME Developments Subdivision were calculated as part of the storm sewer design submitted to the City.

5.5.2.2.5 Outlet Design and By-Pass

The release rate from the extended detention pond is controlled by an orifice installed at the outlet control structure designed as per MOE SWMPD Manual (refer to the Stormwater Management Facility Details, DWG. 08-0108-SWMF2, Appendix E). The outlet is designed to minimize the potential for clogging and to provide 24 hours of detention for the water quality design storm. Using the standard falling head orifice equation, an orifice with a diameter of 220 mm was selected for this design. This orifice is submerged to minimize the potential for clogging. A sample falling head orifice calculation is provided in Appendix 'D'. A 2,400 mm x 2,400 mm manhole provides access to the outlet controls for maintenance purposes.

5.5.2.2.6 Site Grading and Planting Strategy

As previously mentioned, a sediment forebay is proposed at the upstream end of the wet pond. This area will improve sediment removal near the sewer inlets from ACME Developments and Gorde Street, and will simplify future maintenance operations. The forebay will include a hard bottomed surface in order to allow vehicular access for maintenance. The proposed surface will be an interlocking stone with openings to allow growth of vegetation.

The forebay is separated from the rest of the pond by an earthen berm. This berm is submerged slightly below the permanent pool at the outlet of the forebay; the berm extends slightly above the extended detention elevations along the length of the forebay in order to direct the flow of stormwater to the forebay outlet and prevent short-circuiting of stormwater. The area of the forebay is less than 33% of the overall pond surface area, as recommended in the MOE SWMPD Manual. Sample calculations used to size the forebay and review the scour potential through the pond are presented in Appendix 'D'.

A planting strategy will be established based on MOE guidelines. This planting strategy will include submergent vegetation for deep water areas, emergent vegetation for shallow water areas, and vegetation for extended detention, flood fringe and upland areas. Details of this planting strategy will be included in the final landscaping plans prior to construction.

Grading around the wet pond is designed to promote safety and improve treatment. The side slopes are terraced using sections of flat grading (5:1 and 7:1 slopes) and sections of 3:1 slopes in between. The side slopes are graded at 7:1 around the permanent pool elevation and extend more than 3 m on either side of the normal water elevation.

5.6 Erosion and Sediment control during construction

This section outlines the intent of proposed erosion and sediment control methods for construction of this project. Since the contractor also has a responsibility to minimize construction impacts on downstream watercourses, a final erosion and sediment control plan will be established through consultation with the contractor prior to construction.

Although ACME Developments Subdivision is sub-divided into two phases for design and approvals, it will likely be constructed in smaller phases. These phases are outlined on the Overall Site Plan Drawing No. 94-1029-OS1, Appendix E. This phasing will reduce the amount of land that is disturbed at one time, thereby reducing the overall erosion potential from the site.

Construction will begin with the installation of roads and services within the road right of way, and followed by construction of homes on individual lots. This method of construction will also reduce the amount of land that is disturbed at the same time since the majority of construction within the roadway will be completed and reinstated before construction begins on building lots.

A number of erosion and sediment control measures will be established during construction. These measures include the following:

- Minimize the area of soil exposed at any time. This is achieved in part by constructing the subdivision in phases as outlined above.
- Apply soil cover as soon as possible after soil is disturbed. It is expected that construction will proceed quickly for each of the phases. This will minimize the amount of time that disturbed soil is exposed to erosive forces.
- Sediment will be intercepted as close to the source as possible. Proposed sediment controls for this development include covering catch basin inlets with filter cloth and crushed stone, installing straw bale check dams or crushed stone filter berms in drainage swales, and installing sediment control fences around disturbed areas of building lots. These controls will be installed before construction begins.
- Ensure that sediment control structures are properly constructed, inspected and maintained.
- Control dust during construction by applying calcium chloride to dirt roads, as required, and periodic sweeping of paved roads.

- If dewatering is required, pumped water will be discharged to sediment traps to reduce the amount of sediment sent to storm sewers and outlet ditches.
- If stockpiles are expected to remain for a significant length of time, temporary vegetative cover with mulch will be applied.
- Inspect downstream outlet ditches during construction and remove sediment, if required.

Stormwater will receive additional natural treatment as it travels a significant distance through a flat, grass lined outlet ditch downstream of the site prior to reaching the Clean River, approximately 500 m to the south.

5.7 Operation and Maintenance

Maintenance is an important part of any drainage system, and particularly for urban stormwater management systems. The following is an outline of the principal operation and maintenance activities for ACME Development Subdivision:

- Inspection and maintenance of temporary erosion and sediment controls during construction.
- Inspection and cleaning of catch basin and manhole sumps, quarterly (every 3 months) or after every substantial rainfall.
- Inspection of inlets and outlet for stormwater management pond (SMP) and trash removal as required.
- Maintenance of vegetation around SMP (i.e. grass cutting, weed control, re-planting).
- Measure accumulated sediment and periodic removal of sediments from stormwater management facility.

5.8 Summary of Design Elements, Conclusion and Recommendations

Sanitary and water systems for the proposed development will be extensions of existing municipal systems, which currently have adequate capacities. The proposed work elements are as follows:

A. 1. 300 mm diameter PVC watermain - 270 m on Third Drive

2. 200 mm diameter PVC watermain - 680 m on Second Way and Fifth Road

3. 150 mm diameter PVC watermain - 550 m on Second Way and Sixth Street

B. 1. 250 mm diameter PVC sanitary sewer - 1,150 m on Second Way, Third Drive, Fifth Road and Sixth Street

Stormwater from the development will be collected and treated in accordance with the Anytown Master Drainage Plan such that the final outflow will meet MOE, CRCA, and City of Anytown requirements. The proposed work elements are as follows:

C. 1. 300 mm diameter storm sewer - 334 m on Third Drive, Fifth Road and Sixth Street

2. 375 mm diameter storm sewer - 85 m on Fifth Road and Sixth Street

3. 450 mm diameter storm sewer - 25 m on Sixth Street

4. 600 mm diameter storm sewer - 209 m on Third Drive

5. 750 mm diameter storm sewer - 86 m on Fifth Road

6. 825 mm diameter storm sewer - 186 m on Second Way and stub to Business Area

7. 975 mm diameter storm sewer - 110 m on Second Way

8. 1,050 mm diameter storm sewer - 88 m on Second Way

9. 1,200 mm diameter storm sewer - 142 m on Second Way

10. 1,350 mm diameter storm sewer - 298 m on Second Way

11. 1,650 mm diameter storm sewer - 80 m on Block 294 and easement to the Stormwater Management Facility

D. 1. Inlet to forebay consisting of 1,650 mm diameter inlet storm sewer complete with concrete headwall and rip-rap.

2. Inlet to forebay consisting of 600 mm diameter inlet storm sewer complete with ditch inlet catchbasin at sewer inlet and rip-rap at outlet.

3. Inlet to wet pond consisting of 450 mm diameter inlet storm sewer complete with rip-rap at sewer inlet and outlet.

4. Sediment forebay 36 m long, 18 m wide and 2 m deep, permanent volume of 1000 m^3.

5. Wet pond, permanent pool volume of 13,500 m^3, extended detention volume of 1980 m^3, peak storage volume of 15,000 m^3, total depth of 3.5 m.

This stormwater site management plan describes how lot level and conveyance controls are designed to minimize the impact of the proposed development on the natural hydrologic cycle. An end of pipe stormwater management wet pond complete with forebay and outlet control structure is designed to provide Normal quality control and to reduce peak flow rates after development to pre-development levels for events up to the 1:100 year event. The elements of the Stormwater Management Facility Pond are illustrated in Section 5.5 and are detailed on DWG. 08-0108-SWMF2.

The subdivision will be constructed in phases, and sediment and erosion control methods will be implemented during construction in order to minimize construction impacts on downstream watercourses. Maintenance requirements for this development will be typical of conventional storm sewer systems and wet ponds, and will consist primarily of periodic inspection, removal of sediments, and landscape maintenance.

Report Signature Page

CONSULTING LTD.

J. Consultant

Joe Consultant, P.Eng.
Senior Engineer

B. Reviewer

Bob Reviewer, P.Eng.
Associate

JC/BR/cg

APPENDIX A

Water Distribution Calculations

Water Demand and Boundary Conditions

Water Demand as per Water Master Plan, 1997
Unit Water Demand Standards - Subdivision Level (1,001 - 2000 persons)

Unit	Persons/Unit
Single	3.8
Semi-detached	3.8
Townhouses	3.5

Residential:

Average Daily Demand	0.31 m^3/c.d.
Maximum Daily	1.085 m^3/c.d.
Maximum Hourly	1.65 m^3/c.d.

Commercial:

Average Daily Demand	22 m^3/ha.d.
Maximum Daily	33 m^3/ha.d. (1.5 X avg. day)
Maximum Hourly	59.4 m^3/ha.d. (1.8 X max. day)

Industrial:

Average Daily Demand	2 m^3/ha.d.
Maximum Daily	3 m^3/ha.d. (1.5 X avg. day)
Maximum Hourly	5.4 m^3/ha.d. (1.8 X max. day)

Institutional:

Average Daily Demand	22 m^3/ha.d.
Maximum Daily	33 m^3/ha.d. (1.5 X avg. day)
Maximum Hourly	59.4 m^3/ha.d. (1.8 X max. day)

Boundary Conditions provided

	HGL - Metres	
Scenario	**Ninth Dr.**	**Gorde St.**
No Fire	156.7	156.7 ref. letter dated Dec. 15, 1999
Peak Hour	152	N/A ref. letter dated Oct. 20, 1999
Max. Day + 13000 L/min. fire	144	142.0 ref. letter dated Dec. 15, 1999

Table 3-2
Unit Water Demand Standards - Subdivision Level
(<3,000 persons)

	Units	Current Standard	Revised Standards (by number of persons)			
			0-500	501-1,000	1,001-2,000	2,001-3,000
Existing Units (Pre-Development)						
Average Daily Demand						
Residential	Lpcd	450	350	350	350	350
Commercial	L/ha/d	60,000	22,000	22,000	22,000	22,000
Industrial	L/ha/d	20,000	2,000	2,000	2,000	2,000
Institutional	L/ha/d	15,000	22,000	22,000	22,000	22,000
Maximum Daily Demand						
Residential	Lpcd	1,125	1,350	1,240	1,125	1,015
Commercial	L/ha/d	90,000	33,000	33,000	33,000	33,000
Industrial	L/ha/d	30,000	3,000	3,000	3,000	3,000
Institutional	L/ha/d	22,500	33,000	33,000	33,000	33,000
Peak Hour Demand (evening)						
Residential	Lpcd	2,475	2,160-6,750	1,860	1,690	1,525
Commercial	L/ha/d	72,000	26,400	26,400	26,400	26,400
Industrial	L/ha/d	24,000	2,400	2,400	2,400	2,400
Institutional	L/ha/d	18,000	26,400	26,400	26,400	26,400
Peak Hour Demand (daytime)						
Residential	Lpcd	1,125	1,350	1,240	1,125	1,015
Commercial	L/ha/d	162,000	59,400	59,400	59,400	59,400
Industrial	L/ha/d	54,000	5,400	5,400	5,400	5,400
Institutional	L/ha/d	40,500	59,400	59,400	59,400	59,400
Future Units (Post 1991 Development)						
Average Daily Demand						
Residential	Lpcd	450	310	310	310	310
Commercial	L/ha/d	60,000	22,000	22,000	22,000	22,000
Industrial	L/ha/d	20,000	2,000	2,000	2,000	2,000
Institutional	L/ha/d	15,000	22,000	22,000	22,000	22,000
Maximum Daily Demand						
Residential	Lpcd	1,125	1,310	1,200	1,085	975
Commercial	L/ha/d	90000	33,000	33,000	33,000	33,000
Industrial	L/ha/d	30,000	3,000	3,000	3,000	3,000
Institutional	L/ha/d	22,500	33,000	33,000	33,000	33,000
Peak Hour Demand (evening)						
Residential	Lpcd	2,475	2,120-6,710	1,820	1,650	1,485
Commercial	L/ha/d	72,000	26,400	26,400	26,400	26,400
Industrial	L/ha/d	24,000	2,400	2,400	2,400	2,400
Institutional	L/ha/d	18,000	26,400	26,400	26,400	26,400
Peak Hour Demand (daytime)						
Residential	Lpcd	1,125	1,310	1,200	1,085	975
Commercial	L/ha/d	162,000	59,400	59,400	59,400	59,400
Industrial	L/ha/d	54,000	5,400	5,400	5,400	5,400
Institutional	L/ha/d	40,500	59,400	59,400	59,400	59,400

File No.: 08-XXXX
Project: ACME Developments
Date: September 8, 2008

Water Supply Calculations

Consulting Ltd.

		Residential								Commercial							Institutional							Total					
Junction		Single	Population	Average Demand		Max. Day Demand		Max. Hour Demand		Area	Average Demand		Max. Day Demand		Max. Hour Demand		Area	Average Demand		Max. Day Demand		Max. Hour Demand		Average Demand		Max. Day Demand		Max. Hour Demand	
Model	Plan	Units		m3/day	L/min	m3/day	L/min	m3/day	L/min	ha	m3/day	L/min	m3/day	L/min	m3/day	L/min	ha	m3/day	L/min	m3/day	L/min	m3/day	L/min	m3/day	L/min	m3/day	L/min	m3/day	L/min
2	41	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	40	3	11.4	3.53	2.45	12.37	8.59	18.81	13.06	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	3.53	2.45	12.37	8.59	18.81	13.06
5	38	17	64.6	20.03	13.91	70.09	48.67	106.59	74.02	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	20.03	13.91	70.09	48.67	106.59	74.02
6	32	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	28	14	53.2	16.49	11.45	57.72	40.08	87.78	60.96	0	0.00	0.00	0.00	0.00	0.00	0.00	3.053	67.17	46.64	100.75	69.96	181.35	125.94	83.66	58.10	158.47	110.05	269.13	186.89
10	23	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	17	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	7	3	11.4	3.53	2.45	12.37	8.59	18.81	13.06	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	3.53	2.45	12.37	8.59	18.81	13.06
16	6	8	30.4	9.42	6.54	32.98	22.91	50.16	34.83	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	9.42	6.54	32.98	22.91	50.16	34.83
19	37	21	79.8	24.74	17.18	86.58	60.13	131.67	91.44	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	24.74	17.18	86.58	60.13	131.67	91.44
20	31	14	53.2	16.49	11.45	57.72	40.08	87.78	60.96	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	16.49	11.45	57.72	40.08	87.78	60.96
21	33	12	45.6	14.14	9.82	49.48	34.36	75.24	52.25	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	14.14	9.82	49.48	34.36	75.24	52.25
23	34	3	11.4	3.53	2.45	12.37	8.59	18.81	13.06	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	3.53	2.45	12.37	8.59	18.81	13.06
25	35	12	45.6	14.14	9.82	49.48	34.36	75.24	52.25	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	14.14	9.82	49.48	34.36	75.24	52.25
28	36	18	68.4	21.20	14.73	74.21	51.54	112.86	78.38	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	21.20	14.73	74.21	51.54	112.86	78.38
30	20	9	34.2	10.60	7.36	37.11	25.77	56.43	39.19	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	10.60	7.36	37.11	25.77	56.43	39.19
31	19	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	18	19	72.2	22.38	15.54	78.34	54.40	119.13	82.73	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	22.38	15.54	78.34	54.40	119.13	82.73
33	16	16	60.8	18.85	13.09	65.97	45.81	100.32	69.67	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	18.85	13.09	65.97	45.81	100.32	69.67
34	15	7	26.6	8.25	5.73	28.86	20.04	43.89	30.48	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	8.25	5.73	28.86	20.04	43.89	30.48
35	21	8	30.4	9.42	6.54	32.98	22.91	50.16	34.83	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	9.42	6.54	32.98	22.91	50.16	34.83
37	22	14	53.2	16.49	11.45	57.72	40.08	87.78	60.96	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	16.49	11.45	57.72	40.08	87.78	60.96
38	24	8	30.4	9.42	6.54	32.98	22.91	50.16	34.83	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	9.42	6.54	32.98	22.91	50.16	34.83
40	25	8	30.4	9.42	6.54	32.98	22.91	50.16	34.83	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	9.42	6.54	32.98	22.91	50.16	34.83
42	30	13	49.4	15.31	10.63	53.60	37.22	81.51	56.60	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	15.31	10.63	53.60	37.22	81.51	56.60
44	26	16	60.8	18.85	13.09	65.97	45.81	100.32	69.67	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	18.85	13.09	65.97	45.81	100.32	69.67
45	29	21	79.8	24.74	17.18	86.58	60.13	131.67	91.44	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	24.74	17.18	86.58	60.13	131.67	91.44
46	12	9	34.2	10.60	7.36	37.11	25.77	56.43	39.19	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	10.60	7.36	37.11	25.77	56.43	39.19
47	13	10	38	11.78	8.18	41.23	28.63	62.70	43.54	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	11.78	8.18	41.23	28.63	62.70	43.54
48	11	9	34.2	10.60	7.36	37.11	25.77	56.43	39.19	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	10.60	7.36	37.11	25.77	56.43	39.19
49	10	8	30.4	9.42	6.54	32.98	22.91	50.16	34.83	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	9.42	6.54	32.98	22.91	50.16	34.83
52	1	3	11.4	3.53	2.45	12.37	8.59	18.81	13.06	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	3.53	2.45	12.37	8.59	18.81	13.06
54	2	5	19	5.89	4.09	20.62	14.32	31.35	21.77	0.487	10.71	7.44	16.07	11.16	28.93	20.09	0	0.00	0.00	0.00	0.00	0.00	0.00	16.60	11.53	36.69	25.48	60.28	41.86
56	4	10	38	11.78	8.18	41.23	28.63	62.70	43.54	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	11.78	8.18	41.23	28.63	62.70	43.54
59	8	5	19	5.89	4.09	20.62	14.32	31.35	21.77	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	5.89	4.09	20.62	14.32	31.35	21.77
		0	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
63	5	14	53.2	16.49	11.45	57.72	40.08	87.78	60.96	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	16.49	11.45	57.72	40.08	87.78	60.96
64	9	10	38	11.78	8.18	41.23	28.63	62.70	43.54	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	11.78	8.18	41.23	28.63	62.70	43.54
66	39	95	361	111.91	77.72	391.69	272.00	595.65	413.65	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	111.91	77.72	391.69	272.00	595.65	413.65
67	14	6	22.8	7.07	4.91	24.74	17.18	37.62	26.13	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	7.07	4.91	24.74	17.18	37.62	26.13
68	3	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	448.00	1702.40	527.74	366.49	1847.10	1282.71	2808.96	1950.67	0.49	10.71	7.44	16.07	11.16	28.93	20.09	3.05	67.17	46.64	100.75	69.96	181.35	125.94	605.62	420.57	1963.92	1363.84	3019.24	2096.69

File No.: 08-XXXX **Fire Flow Requirements** **Consulting Ltd.**
Project: ACME Development
Date: September 8,2008

The following calculations are based on the Fire Underwriters Survey
"Water Supply for Public Fire Protection", 1999 edition.
An estimate of the required fire flow for a given area may be determined by the formula:

$$F=220xCxA^{0.5}$$

where:
F = required flow in litres per minute
C = coefficient related to type of construction
A = total floor area in square metres

1. Fire Flow Requirement for Typical Residential Unit
1.1 Assumptions:

a) floor area of largest residential home		2500 ft²	232.3m²
b) wood frame construction	C= 1.5		
c) low hazard occupancy	-25% credit/charge		
d) no automatic sprinklers	0% credit		
e) charge for separation	75% charge	(max. charge according to FUS)	

1.2 Calculations:

a) required fire flow	5000.0 L/min.	(rounded to nearest 1000 L/min.)
b) credit/charge for occupancy	-1250.0L/min.	
Sub-total Fire Flow	3750.0 L/min.	
c) credit for sprinklers	0.0 Lmin.	
d) charge for separation	2812.5 L/min.	
Total Fire Flow	**6562.5 L/min.**	

2. Fire Flow Requirement for Proposed School
2.1 Assumptions:

a) floor area		70000 ft²	6503.2 m²
b) non-combustible construction	C = 0.8		
c) low hazard occupancy	-15% credit/charge		
d) automatic sprinklers	-30% credit		
e) charge for separation	40% charge	(2 sides @ 15% (Le.10.1-20m) & 2 sides @ 5% (i.e.30.145m))	

2.2 Calculations:

a) required fire flow	14000.0 L/min.	(rounded to nearest 1000 L/min.)
b) credit/charge for occupancy	-2100.0 L/min.	
Sub-total Fire Flow	11900.0 L/min.	
c) credit for sprinklers	-3570.0 L/min.	
d) charge for separation	4760.0 L/min.	
Total Fire Flow	**13090.0 L/min.**	

3. Fire Flow Requirement for Proposed Commercial Building (Ninth Drive)
3.1 Assumptions:

a) floor area		12000 ft²	1114.8 m²
b) ordinary construction	C= 1.0		
c) combustible contents	0% credit/charge		
d) no automatic sprinklers	0% credit		
e) charge for separation	45% charge	(1 side @ 20% (i.e.3.1-10m) & 2 sides @ 10% (Le.20.1-30m) & 1 side @ 5% (i.e. 30.1-45m)	

3.2 Calculations:

a) required fire flow	7000.0 L/min.	(rounded to nearest 1000 L/min.)
b) credit/charge for occupancy	0.0 L/min.	
Sub-total Fire Flow	7000.0 L/min.	
c) credit for sprinklers	0.0 L/min.	
d) charge for separation	3150.0 L/min.	
Total Fire Flow	**10150.0 L/min.**	

Analysis Results
Scenario: Base-Avg. Day
Steady State Analysis

Title:
Project Engineer:
Project Date:
Comments:

Scenario Summary	
Label	Max. Day
Demand Alternative	Demand-Max. Day
Physical Alternative	Base-Physical
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational
Age Alternative	Base-Age Alternative
Constituent Alternative	Base-Constituent
Trace Alternative	Base-Trace Alternative
Fire Flow Alternative	Base-Fire Flow

Liquid Characteristics			
Liquid	Water at 20ºC (68ºF)	Specific Gravity	1.00
Kinematic Viscosity	0.1004e-5 m²/s		

Network Inventory			
Number of Pipes	77	Number of Tanks	0
Number of Reservoirs	2	-Constant Area:	0
Number of Junctions	65	-Variable Area:	0
Number of Pumps	0	Number of Valves	0
-Constant Power:	0	-FCV's:	0
-One Point (Design Point):	0	-PBV's:	0
-Standard (3 Point):	0	-PRV's:	0
-Standard Extended:	0	-PSV's:	0
-Custom Extended:	0	-TCV's:	0
-Multiple Point:	0	Number of Spot Elevations	0

Pipe Inventory			
Total Length	5,118.10 m		
150 mm	1,652.00 m	300 mm	1,794.00 m
200 mm	1,671.50 m	1200 mm	0.60 m

Junctions @ 0.00 hr

Label	Constituent (mg/l)	Calculated Hydraulic Grade (M)	Pressure (lbs./in²)	Demand (Calculated) (l/min.)	Pressure Head (m)
J-1	N/A	156.70	71.788	0.00	50.60
J-2	N/A	156.70	72.214	0.00	50.90
J-3	N/A	156.70	74.199	2.45	52.30
J-4	N/A	156.70	73.915	0.00	52.10
J-5	N/A	156.70	73.631	13.91	51.90
J-6	N/A	156.70	73.631	0.00	51.90
J-7	N/A	156.70	73.631	0.00	51.90
J-8	N/A	156.70	73.631	58.11	51.90
J-9	N/A	156.70	72.212	0.00	50.90
J-10	N/A	156.70	73.347	0.00	51.70
J-11	N/A	156.70	71.220	0.00	50.20
J-12	N/A	156.70	72.497	0.00	50.10
J-13	N/A	156.70	71.221	0.00	50.20
J-14	N/A	156.70	71.221	2.45	50.20
J-15	N/A	156.70	71.008	0.00	50.05
J-16	N/A	156.70	71.008	6.54	50.05

Analysis Results
Scenario: Base-Avg.Day
Steady State Analysis

Junctions @ 0.00 hr					
Label	**Constituent (mg/l)**	**Calculated Hydraulic Grade (M)**	**Pressure (lbs./in²)**	**Demand (Calculated) (l/min.)**	**Pressure Head (m)**
J-17	N/A	156.70	71.008	0.00	50.05
J-18	N/A	156.70	70.794	0.00	49.90
J-19	N/A	156.70	71.219	17.18	50.20
J-20	N/A	156.70	68.665	11.45	48.40
J-21	N/A	156.70	74.694	9.82	52.65
J-22	N/A	156.70	74.694	0.00	52.65
J-23	N/A	156.70	75.403	2.45	53.15
J-24	N/A	156.70	75.616	0.00	53.30
J-25	N/A	156.70	75.616	9.82	53.30
J-26	N/A	156.70	75.403	0.00	53.15
J-27	N/A	156.70	77.035	0.00	54.30
J-28	N/A	156.70	76.325	14.73	53.80
J-29	N/A	156.70	76.538	0.00	53.95
J-30	N/A	156.70	76.468	7.36	53.90
J-31	N/A	156.70	72.921	0.00	51.40
J-32	N/A	156.70	72.212	15.54	50.90
J-33	N/A	156.70	68.949	13.09	48.60
J-34	N/A	156.70	66.537	5.73	46.90
J-35	N/A	156.70	67.247	6.54	47.40
J-36	N/A	156.70	69.091	0.00	48.70
J-37	N/A	156.70	71.361	11.45	50.30
J-38	N/A	156.70	72.779	6.54	51.30
J-39	N/A	156.70	72.779	0.00	51.30
J-40	N/A	156.70	73.985	6.54	52.15
J-41	N/A	156.70	72.921	0.00	51.40
J-42	N/A	156.70	75.758	10.63	53.40
J-43	N/A	156.70	75.474	0.00	53.20
J-44	N/A	156.70	76.113	13.09	53.65
J-45	N/A	156.70	74.694	17.18	52.65
J-46	N/A	156.70	74.766	7.36	62.70
J-47	N/A	156.70	74.057	8.18	52.20
J-48	N/A	156.70	73.986	7.36	52.15
J-49	N/A	156.70	72.922	6.54	51.40
J-51	N/A	156.70	72.213	0.00	50.90
J-52	N/A	156.70	67.958	2.45	47.90
J-53	N/A	156.70	68.809	0.00	48.50
J-54	N/A	156.70	69.569	11.53	49.05
J-55	N/A	156.70	70.086	0.00	49.40
J-56	N/A	156.70	70.228	8.18	49.50
J-57	N/A	156.70	70.937	0.00	50.00
J-58	N/A	156.70	71.504	0.00	50.40
J-59	N/A	156.70	72.213	4.09	50.90
J-60	N/A	156.70	72.497	0.00	51.10
J-61	N/A	156.70	73.632	0.00	51.90
J-63	N/A	156.70	69.376	11.45	48.90
J-64	N/A	156.70	71.930	8.18	50.70
J-66	N/A	156.70	73.630	77.72	51.90
J-67	N/A	156.70	76.469	4.91	53.90
J-68	N/A	156.70	69.589	0.00	49.05

Analysis Results
Scenario: Base-Avg. Day
Steady State Analysis

Revervoirs @ 0.00 hr

Label	Constituent (mg/l)	Calculated Hydraulic Grade (m)	Reservoir Inflow (l/min)	Reservoir Outflow (l/min)
R-1	N/A	156.70	N/A	151.22
R-3	N/A	156.70	N/A	269.33

Pipes @ 0.00 hr

Label	Status	Constituent (mg/l)	Flow (l/min)	Velocity (m/s)	From Grade (m)	To Grade (m)	Friction Loss (m)	Minor Loss (m)	Total Headloss (m)	Headloss Gradient (m/km)
P-3	Open	N/A	0.00	0.00	156.70	156.70	0.00	0.00	0.00	0.00
P-4	Open	N/A	151.22	0.04	156.70	156.70	0.54e-3	0.13e-3	0.67e-3	0.01
P-5	Open	N/A	119.06	0.03	156.70	156.70	0.11e-3	0.44e-4	0.15e-3	0.01
P-6	Open	N/A	119.06	0.03	156.70	156.70	0.65e-3	0.22e-4	0.67e-3	0.01
P-7	Open	N/A	29.69	0.01	156.70	156.70	0.35e-4	0.23e-5	0.37e-4	0.38e-3
P-8	Open	N/A	-1.55	0.37e-3	156.70	156.70	-0.61e-8	0.61e-8	0.00	0.00
P-9	Open	N/A	-1.55	0.37e-3	156.70	156.70	-0.51e-3	0.51e-8	0.00	0.00
P-10	Open	N/A	-59.66	0.01	156.70	156.70	0.22e-3	0.4e-5	0.22e-3	0.17e-2
P-11	Open	N/A	-59.66	0.01	156.70	156.70	0.28e-4	0.9e-5	0.37e-4	0.19e-2
P-12	Open	N/A	89.79	0.02	156.70	156.70	0.29e-3	0.43e-4	0.33e-3	0.42e-2
P-13	Open	N/A	-133.60	0.03	156.70	156.70	0.12e-3	0.63e-4	0.19e-3	0.01
P-14	Open	N/A	-133.60	0.03	156.70	156.70	0.55e-3	0.87e-4	0.63e-3	0.01
P-15	Open	N/A	-226.73	0.05	156.70	156.70	0.61e-4	0.51e-4	0.11e-3	0.04
P-16	Open	N/A	12.67	0.3e-2	156.70	156.70	-0.76e-6	0.76e-6	0.00	0.00
P-17	Open	N/A	12.67	0.3e-2	156.70	156.70	-0.32e-6	0.32e-6	0.00	0.00
P-18	Open	N/A	0.00	0.00	156.70	156.70	0.00	0.00	0.00	0.00
P-19	Open	N/A	-2.45	0.58e-2	156.70	156.70	-0.77e-3	0.77e-8	0.00	0.00
P-20	Open	N/A	-2.45	0.58e-2	156.70	156.70	-0.83e-8	0.83e-8	0.00	0.00
P-21	Open	N/A	-13.98	0.33e-2	156.70	156.70	-0.49e-6	0.49e-6	0.00	0.00
P-22	Open	N/A	-13.98	0.33e-2	156.70	156.70	0.6e-6	0.6e-6	0.00	0.00
P-23	Open	N/A	-27.48	0.01	156.70	156.70	0.36e-4	0.16e-5	0.37e-4	0.54e-3
P-24	Open	N/A	-27.48	0.01	156.70	156.70	0.16e-4	0.23e-5	0.19e-4	0.5e-3
P-25	Open	N/A	93.13	0.02	156.70	156.70	0.21e-3	0.18e-4	0.22e-3	0.43e-2
P-26	Open	N/A	93.13	0.02	156.70	156.70	0.77e-4	0.34e-4	0.11e-3	0.01
P-27	Open	N/A	80.86	0.02	156.70	156.70	0.21e-3	0.14e-4	0.22e-3	0.31e-2
P-28	Open	N/A	80.86	0.02	156.70	156.70	0.73e-4	0.2e-4	0.93e-4	0.49e-2
P-29	Open	N/A	63.13	0.01	156.70	156.70	0.12e-3	0.84e-5	0.13e-3	0.18e-2
P-30	Open	N/A	63.13	0.01	156.70	156.70	0.52e-4	0.23e-4	0.74e-4	0.3e-2
P-31	Open	N/A	4.91	0.12e-2	156.70	156.70	-0.51e-7	0.51e-7	0.00	0.00
P-33	Open	N/A	29.71	0.02	156.70	156.70	0.34e-3	0.15e-4	0.35e-3	0.35e-2
P-34	Open	N/A	29.71	0.02	156.70	156.70	0.42e-3	0.44e-5	0.43e-3	0.36e-2
P-35	Open	N/A	12.53	0.01	156.70	156.70	0.72e-4	0.27e-5	0.74e-4	0.64e-3
P-36	Open	N/A	1.08	0.57e-3	156.70	156.70	-0.19e-7	0.19e-7	0.00	0.00
P-37	Open	N/A	32.32	0.02	156.70	156.70	0.41e-3	0.37e-4	0.45e-3	0.46e-2
P-38	Open	N/A	14.91	0.01	156.70	156.70	-0.24e-5	0.24e-5	0.00	0.00
P-39	Open	N/A	14.91	0.01	156.70	156.70	0.71e-4	0.35e-5	0.74e-4	0.13e-2
P-40	Open	N/A	18.76	0.01	156.70	156.70	0.1e-3	0.92e-5	0.11e-3	0.14e-2
P-41	Open	N/A	18.76	0.01	156.70	156.70	0.32e-4	0.55e-5	0.37e-4	0.21e-2
P-42	Open	N/A	6.15	0.01	156.70	156.70	0.91e-4	0.19e-5	0.93e-4	0.91e-3
P-43	Open	N/A	6.15	0.01	156.70	156.70	0.37e-4	0.69e-6	0.37e-4	0.12e-2
P-44	Open	N/A	-8.58	0.01	156.70	156.70	0.17e-3	0.12e-5	0.17e-3	0.18e-2
P-45	Open	N/A	-8.58	0.01	156.70	156.70	0.15e-3	0.83e-6	0.15e-3	0.16e-2
P-46	Open	N/A	-8.58	0.01	156.70	156.70	0.33e-4	0.46e-5	0.37e-4	0.3e-2
P-47	Open	N/A	-26.24	0.01	156.70	156.70	0.24e-3	0.19e-4	0.26e-3	0.3e-2
P-48	Open	N/A	-3.22	0.3e-2	156.70	156.70	0.18e-4	0.7e-6	0.19e-4	0.19e-3
P-49	Open	N/A	-18.76	0.02	156.70	156.70	0.74e-3	0.21e-4	0.76e-3	0.01
P-50	Open	N/A	25.06	0.01	156.70	156.70	0.27e-3	0.11e-4	0.28e-3	0.25e-2

Analysis Results
Scenario: Base-Avg. Day
Steady State Analysis

Pipes @ 0.00 hr

Label	Status	Constituent (mg/l)	Flow (l/min)	Velocity (m/s)	From Grade (m)	To Grade (m)	Friction Loss (m)	Minor Loss (m)	Total Headloss (m)	Headloss Gradient (m/km)
P-50	Open	N/A	25.06	0.01	156.70	156.70	0.27e-3	0.11e-4	0.28e-3	0.25e-2
P-51	Open	N/A	11.97	0.01	156.70	156.70	0.92e-4	0.12e-5	0.93e-4	0.78e-3
P-52	Open	N/A	6.24	0.33e-2	156.70	156.70	0.18e-4	0.22e-6	0.19e-4	0.22e-3
P-53	Open	N/A	-0.30	0.16e-3	156.70	156.70	-0.26e-9	0.26e-9	0.00	0.00
P-54	Open	N/A	-0.30	0.16e-3	156.70	156.70	0.19e-4	0.59e-9	0.19e-4	0.18e-3
P-55	Open	N/A	-11.57	0.01	156.70	156.70	0.34e-4	0.31e-5	0.37e-4	0.5e-3
P-56	Open	N/A	18.37	0.02	156.70	156.70	0.6e-3	0.35e-4	0.63e-3	0.01
P-57	Open	N/A	2.24	0.21e-2	156.70	156.70	-0.17e-6	0.17e-6	0.00	0.00
P-58	Open	N/A	2.24	0.21e-2	156.70	156.70	0.18e-4	0.46e-6	0.19e-4	0.28e-3
P-59	Open	N/A	8.55	0.45e-2	156.70	156.70	0.16e-4	0.21e-5	0.19e-4	0.72e-3
P-60	Open	N/A	8.55	0.45e-2	156.70	156.70	0.37e-4	0.52e-7	0.37e-4	0.32e-3
P-61	Open	N/A	19.18	0.01	156.70	156.70	0.68e-4	0.6e-5	0.74e-4	0.16e-2
P-62	Open	N/A	-23.49	0.01	156.70	156.70	0.16e-3	0.9e-5	0.17e-3	0.25e-2
P-63	Open	N/A	-23.49	0.01	156.70	156.70	0.3e-4	0.74e-5	0.37e-4	0.41e-2
P-64	Open	N/A	-46.51	0.02	156.70	156.70	0.66e-3	0.79e-4	0.74e-3	0.01
P-65	Open	N/A	4.35	0.41e-2	156.70	156.70	0.54e-4	0.19e-5	0.56e-4	0.56e-3
P-66	Open	N/A	-3.83	0.36e-2	156.70	156.70	0.37e-4	0.27e-6	0.37e-4	0.37e-3
P-67	Open	N/A	-11.19	0.01	156.70	156.70	0.21e-3	0.13e-4	0.28e-3	0.29e-2
P-68	Open	N/A	8.18	0.01	156.70	156.70	0.5e-4	0.61e-5	0.56e-4	0.14e-2
P-71	Open	N/A	6.13	0.01	156.70	156.70	0.11e-3	0.33e-5	0.11e-3	0.11e-2
P-72	Open	N/A	-5.32	0.01	156.70	156.70	0.53e-4	0.28e-5	0.56e-4	0.69e-3
P-73	Open	N/A	-7.59	0.01	156.70	156.70	0.16e-3	0.54e-5	0.17e-3	0.13e-2
P-74	Open	N/A	9.59	0.01	156.70	156.70	0.23e-3	0.72e-5	0.24e-3	0.22e-2
P-75	Open	N/A	2.79	0.26e-2	156.70	156.70	0.18e-4	0.61e-6	0.19e-4	0.17e-3
P-76	Open	N/A	-10.30	0.01	156.70	156.70	0.23e-3	0.97e-5	0.24e-3	0.24e-2
P-151	Open	N/A	75.46	0.02	156.70	156.70	0.53e-3	0.33e-4	0.56e-3	0.29e-2
P-152	Open	N/A	-2.26	0.53e-3	156.70	156.70	-0.29e-7	0.29e-7	0.00	0.00
P-154	Open	N/A	-4.91	0.12e-2	156.70	156.70	-0.24e-7	0.24e-7	0.00	0.00
P-155	Open	N/A	0.00	0.00	156.70	156.70	0.00	0.00	0.00	0.00
P-156	Open	N/A	269.33	0.4e-2	156.70	156.70	0.00	0.00	0.00	0.00
P-157	Open	N/A	151.22	0.22e-2	156.70	156.70	0.00	0.00	0.00	0.00

Analysis Results
Scenario: Max. Day
Fire Flow Analysis

Title:
Project Engineer:
Project Date:
Comments:

Scenario Summary

Label	Max. Day
Demand Alternative	Demand-Max. Day
Physical Alternative	Base-Physical
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational
Age Alternative	Base-Age Alternative
Constituent Alternative	Base-Constituent
Trace Alternative	Base-Trace Alternative
Fire Flow Alternative	Base-Fire Flow

Liquid Characteristics

Liquid	Water at 20ºC (68ºF)	Specific Gravity	1.00
Kinematic Viscosity	0.1004e-5 m²/s		

Network Inventory

Number of Pipes	77	Number of Tanks	0
Number of Reservoirs	2	-Constant Area:	0
Number of Junctions	65	-Variable Area:	0
Number of Pumps	0	Number of Valves	0
-Constant Power:	0	-FCV's:	0
-One Point (Design Point):	0	-PBV's:	0
-Standard (3 Point):	0	-PRV's:	0
-Standard Extended:	0	-PSV's:	0
-Custom Extended:	0	-TCV's:	0
-Multiple Point:	0	Number of Spot Elevations	0

Pipe Inventory

Total Length	5,118.1 m		
150 mm	1,652 m	300 mm	1,794.00 m
200 mm	1,671.5 m	1200 mm	0.60 m

Junctions @ 0.00 hr

Label	Constituent (mg/l)	Calculated Hydraulic Grade (M)	Pressure (lbs./in²)	Demand (Calculated) (l/min.)	Pressure Head (m)
J-1	N/A	142.00	50.933	0.00	35.90
J-2	N/A	142.00	51.359	0.00	36.20
J-3	N/A	142.29	53.756	8.59	37.89
J-4	N/A	142.37	53.585	0.00	37.77
J-5	N/A	142.66	53.714	48.67	37.86
J-6	N/A	142.79	53.898	0.00	37.99
J-7	N/A	142.83	53.950	0.00	38.03
J-8	N/A	143.05	54.267	110.05	38.25
J-9	N/A	143.31	53.220	0.00	37.51
J-10	N/A	143.37	54.435	0.00	38.37
J-11	N/A	143.57	52.599	0.00	37.07
J-12	N/A	143.67	54.013	0.00	38.07
J-13	N/A	143.96	53.141	0.00	37.46
J-14	N/A	144.00	53.203	8.59	37.50
J-15	N/A	144.00	52.990	0.00	37.35
J-16	N/A	144.00	52.990	22.91	37.35

Analysis Results
Scenario: Max Day
Fire Flow Analysis

Junctions @ 0.00 hr					
Label	Constituent (mg/l)	Calculated Hydraulic Grade (M)	Pressure (lbs./in²)	Demand (Calculated) (l/min.)	Pressure Head (m)
J-17	N/A	144.00	52.990	0.00	37.35
J-18	N/A	142.39	50.498	0.00	35.59
J-19	N/A	142.51	51.091	60.13	36.01
J-20	N/A	142.65	48.736	40.08	34.35
J-21	N/A	142.81	54.986	34.36	38.76
J-22	N/A	142.81	54.986	0.00	38.78
J-23	N/A	142.81	55.695.	8.59	39.28
J-24	N/A	142.87	55.998	0.00	39.47
J-25	N/A	142.89	56.022	34.38	39.49
J-26	N/A	142.97	55.931	0.00	39.42
J-27	N/A	143.11	57.755	0.00	40.71
J-28	N/A	143.00	56.891	51.54	40.10
J-29	N/A	143.22	57.416	0.00	40.47
J-30	N/A	143.24	57.373	25.71	40.44
J-31	N/A	143.35	53.986	0.00	38.05
J-32	N/A	143.44	53.402	54.40	37.64
J-33	N/A	143.52	50.247	45.81	35.42
J-34	N/A	143.47	47.765	20.04	33.87
J-35	N/A	143.44	48.430	22.91	34.14
J-36	N/A	143.42	50.257	0.00	35.42
J-37	N/A	143.39	52.479	40.08	38.99
J-38	N/A	143.18	53.597	22.91	37.78
J-39	N/A	143.18	53.597	0.00	37.78
J-40	N/A	143.18	54.803	22.91	38.83
J-41	N/A	143.32	53.945	0.00	38.02
J-42	N/A	143.08	56.433	37.22	39.78
J-43	N/A	142.87	55.860	0.00	39.37
J-44	N/A	143.05	56.751	45.81	40.00
J-45	N/A	142.97	55.220	60.13	38.92
J-46	N/A	143.78	58.410	25.77	39.76
J-47	N/A	143.77	55.720	28.63	39.27
J-48	N/A	143.80	55.681	25.77	39.25
J-49	N/A	143.82	54.655	22.91	38.52
J-51	N/A	143.76	53.858	0.00	37.96
J-52	N/A	144.00	49.939	6.59	35.20
J-53	N/A	144.00	50.790	0.00	35.80
J-54	N/A	144.00	51.571	26.48	36.35
J-55	N/A	144.00	52.067	0.00	38.70
J-56	N/A	144.00	52.209	28.63	36.80
J-57	N/A	144.00	52.919	0.00	37.30
J-58	N/A	143.92	53.366	0.00	37.62
J-59	N/A	143.89	54.046	14.32	38.09
J-60	N/A	143.84	54.258	0.00	38.24
J-61	N/A	143.78	55.307	0.00	38.98
J-63	N/A	144.00	51.357	40.08	36.20
J-64	N/A	143.89	53.761	28.83	37.89
J-66	N/A	142.75	53.838	272.00	37.95
J-67	N/A	143.76	58.112	17.18	40.96
J-68	N/A	144.00	51.571	0.00	36.35

Analysis Results
Scenario: Max Day
Fire Flow Analysis

Revervoirs @ 0.00 hr

Label	Constituent (mg/l)	Calculated Hydraulic Grade (m)	Reservoir Inflow (l/min)	Reservoir Outflow (l/min)
R-1	N/A	142.00	3782.05	N/A
R-3	N/A	144.00	N/A	5145.90

Pipes @ 0.00 hr

Label	Status	Constituent (mg/l)	Flow (l/min)	Velocity (m/s)	From Grade (m)	To Grade (m)	Friction Loss (m)	Minor Loss (m)	Total Headloss (m)	Headloss Gradient (m/km)
P-3	Open	N/A	0.00	0.00	142.00	142.00	0.00	0.00	0.00	0.00
P-4	Open	N/A	-3,782.05	0.89	142.00	142.29	0.21	0.08	0.29	5.22
P-5	Open	N/A	-3,165.51	0.75	142.29	142.37	0.05	0.03	0.08	4.42
P-6	Open	N/A	-3,165.51	0.75	142.37	142.66	0.28	0.02	0.29	2.85
P-7	Open	N/A	-2,065.58	0.49	142.66	142.79	0.12	0.01	0.13	1.34
P-8	Open	N/A	-2.560.62	0.60	142.79	142.83	0.02	0.02	0.04	3.32
P-9	Open	N/A	-2,560.62	0.60	142.83	143.05	0.21	0.01	0.22	1.94
P-10	Open	N/A	-2,670.67	0.63	143.05	143.31	0.25	0.01	0.26	2.03
P-11	Open	N/A	-2,670.67	0.63	143.31	143.37	0.04	0.02	0.06	2.89
P-12	Open	N/A	-2,759.77	0.85	143.37	143.57	0.17	0.04	0.21	2.61
P-13	Open	N/A	-3,498.10	0.82	143.57	143.67	0.05	0.04	0.10	5.85
P-14	Open	N/A	-3,498.10	1.18	143.96	144.00	0.23	0.06	0.29	4.10
P-15	Open	N/A	-5,011.62	1.18	143.96	144.00	0.02	0.02	0.04	14.61
P-16	Open	N/A	43.57	0.01	144.00	144.00	0.65e-4	0.9e-5	0.74e-4	0.12e-2
P-17	Open	N/A	43.57	0.01	144.00	144.00	0.55e-5	0.38e-5	0.93e-5	0.89e-3
P-18	Open	N/A	0.00	0.00	144.00	144.00	0.00	0.00	0.00	0.00
P-19	Open	N/A	-8.59	0.2e-2	144.00	144.00	0.92e-5	0.94e-7	0.93e-5	0.2e-3
P-20	Open	N/A	-8.59	0.2e-2	144.00	144.00	-0.1e-6	0.1e-6	0.00	0.00
P-21	Open	N/A	-34.07	0.01	144.00	144.00	0.44e-4	0.29e-5	0.47e-4	0.72e-3
P-22	Open	N/A	-34.07	0.01	144.00	144.00	0.57e-5	0.36e-5·	0.93e-5	0.45e-3
P-23	Open	N/A	-82.12	0.02	144.00	144.00	0.22e-3	0.14e-4	0.23e-3	0.34e-2
P-24	Open	N/A	-82.12	0.02	144.00	144.00	0.12e-3	0.21e-4	0.14e-3	0.38e-2
P-25	Open	N/A	1,513.52	0.35	143.95	143.92	0.04	0.48e-2	0.04	0.78
P-26	Open	N/A	1,513.52	0.36	143.92	143.89	0.01	0.01	0.02	1.20
P-27	Open	N/A	1,470.57	0.35	143.89	143.84	0.05	0.45e-2	0.05	0.72
P-28	Open	N/A	1,470.57	0.35	143.84	143.82	0.01	0.01	0.02.	1.00
P-29	Open	N/A	1,302.36	0.31	143.82	143.78	0.04	0.36e-2	0.04	0.57
P-30	Open	N/A	1,302.36	0.31	143.78	143.76	0.01	0.01	0.02	0.91
P-31	Open	N/A	17.18	0.41e-2	143.70	143.76	0.87e-5	0.62-e6	0.93e-5	0.14e-3
P-33	Open	N/A	-625.13	0.33	142.29	142.39	0.10	0.01	0.1	1.03
P-34	Open	N/A	-625.13	0.33	142.39	142.51	0.12	0.2e-2	0.12	0.98
P-35	Open	N/A	-685.26	0.36	142.51	142.85	0.13	0.01	0.14	1.21
P-36	Open	N/A	-725.34	0.38	142.65	142.79	0.13	0.01	0.14	1.36
P-37	Open	N/A	-230.30	0.12	142.79	142.81	0.01	0.19e-2	0.02	0.17
P-38	Open	N/A	42.10	0.02	142.81	142.81	0.83e-4	0.19e-4	0.1e-3	0.01
P-39	Open	N/A	42.10	0.02	142.81	142.81	0.39e-3	0.28e-4	0.42e-3	0.01
P-40	Open	N/A	-531.31	0.28	142.81	142.87	0.06	0.01	0.06	0.81
P-41	Open	N/A	-531.31	28.00	142.87	142.89	0.01	0.44e-2	0.02	0.96
P-42	Open	N/A	-242.25	0.23	142.89	142.97	0.08	0.29e-2	0.09	0.84
P-43	Open	N/A	242.25	0.23	142.97	143	0.03	0.11e-2	0.03	0.84
P-44	Open	N/A	-293.79	0.28	143	143.11	0.11	0.14e-2	0.11	1.17
P-45	Open	N/A	-293.79	0.28	143.11	143.22	0.11	0.98e-3	0.11	1.17
P-46	Open	N/A	-293.79	0.28	143.22	143.24	0.01	0.01	0.02	1.59
P-47	Open	N/A	-688.79	0.37	143.24	143.35	0.10	0.01	0.11	1.30
P-48	Open	N/A	-249.70	0.24	143.35	143.44	0.08	0.42e-2	0.09	0.90
P-49	Open	N/A	-304.10	0.29	143.44	143.57	0.13	0.01	0.13	1.29
P-50	Open	N/A	434.24	0.23	143.57	143.52	0.05	0.34e-2	0.06	0.52

Analysis Results
Scenario: Max Day
Fire Flow Analysis

Pipes @ 0.00 hr										
Label	Status	Constituent (mg/l)	Flow (l/min)	Velocity (m/s)	From Grade (m)	To Grade (m)	Friction Loss (m)	Minor Loss (m)	Total Headloss (m)	Headloss Gradient (m/km)
P-51	Open	N/A	388.43	0.21	143.52	143.47	0.05	0.13e-2	0.05	0.41
P-52	Open	N/A	368.39	0.2	143.47	143.44	0.03	0.78e-3	0.03	0.37
P-53	Open	N/A	345.48	0.18	143.44	143.42	0.01	0.34e-3	0.01	0.33
P-54	Open	N/A	345.48	0.18	143.42	143.39	0.03	0.77e-3	0.03	0.33
P-55	Open	N/A	305.40	0.16	143.39	143.37	0.02	0.21e-2	0.02	28.00
P-56	Open	N/A	394.49	0.37	143.37	143.18	0.17	0.02	0.19	2.18
P-57	Open	N/A	4.69	0.44e-2	143.18	143.18	0.86-e5	0.74e-6	0.93e-5	0.93-e3
P-58	Open	N/A	4.69	0.44e-2	143.18	143.18	0.35-e4	0.2e-5	0.37e-4	0.56e-3
P-59	Open	N/A	855.78	0.45	142.87	142.81	0.04	0.02	0.07	2.54
P-60	Open	N/A	855.78	0.45	143.08	142.87	0.20	0.53e-3	0.20	1.73
P-61	Open	N/A	893.00	0.47	143.18	143.08	0.09	0.01	0.10	2.15
P-62	Open	N/A	-911.22	0.48	143.16	143.32	0.13	0.01	0.15	2.14
P-63	Open	N/A	-911.22	0.48	143.32	143.35	0.02	0.01	0.03	3.18
P-64	Open	N/A	-1,350.31	0.72	143.35	143.76	0.34	0.07	0.41	4.80
P-65	Open	N/A	-90.90	0.09	143.76	143.77	0.01	0.85e-3	0.01	0.14
P-66	Open	N/A	-119.53	0.11	143.77	143.80	0.02	0.26e-3	0.02	0.22
P-67	Open	N/A	-145.30	0.14	143.80	143.82	0.02	0.21e-2	0.03	0.34
P-68	Open	N/A	28.63	0.03	143.89	143.89	0.6e-3	0.75e-4	0.68e-3	0.02
P-71	Open	N/A	20.66	0.02	144.00	144.00	0.9e-3	0.37e-4	0.94e-3	0.01
P-72	Open	N/A	-19.42	0.02	144.00	144.00	0.61e-3	0.38e-4	0.65e-3	0.01
P-73	Open	N/A	308.78	0.29	142.97	142.81	0.18	0.01	0.16	1.32
P-74	Open	N/A	366.89	0.35	143.18	142.97	0.20	0.01	0.21	1.84
P-75	Open	N/A	-323.42	0.31	142.89	143.05	0.16	0.01	0.16	1.46
P-76	Open	N/A	-369.23	0.35	143.05	143.24	0.18	0.01	0.19	1.89
P-151	Open	N/A	-1148.60	0.27	142.66	142.75	0.08	0.01	0.09'	0.45
P-152	Open	N/A	-1420.60	0.33	142.75	142.81	0.05	0.01	0.06	0.76
P-154	Open	N/A	-17.18	0.41e-2	143.76	143.76	0.9e-5	0.29e-6	0.93e-5	0.00
P-155	Open	N/A	0.00	0.00	144.00	144.00	0.00	0.00	0.00	0.00
P-156	Open	N/A	5,145'.90	0.08	144.00	144.00	0.00	0.00	0.00	0.00
P-157	Open	N/A	-3782.05	0.06	142.00	142.00	0.00	0.00	0.00	0.00

Scenario: Max. Day
Fire Flow Analysis
Fire Flow Report

Node Label	Needed Fire Flow (l/min)	Total Needed Fire Flow (l/min)	Satisfies Fire Flow Constraints	Available Fire Flow (l/min)	Residual Pressure (lbs/in²)	Calculated Residual Pressure (lbs/in²)	Minimum Zone Pressure (lbs/in²)	Calculated Minimum Zone Pressure (lbs/in²)	Minimum Zone Junction	Pressure (lbs/in²)
J-1	6,600.00	6,600.00	TRUE	13,500.00	20.000	49.929	20.000	47.765	J-34	50.933
J-2	6,600.00	6,600.00	TRUE	13,500.00	20.000	51.359	20.000	47.765	J-34	51.359
J-3	6,600.00	6,608.59	TRUE	13,500.00	20.000	51.653	20.000	47.161	J-20	53.756
J-4	6,600.00	6,600.00	TRUE	13,500.00	20.000	50.844	20.000	46.900	J-20	53.585
J-5	6,600.00	6,648.67	TRUE	13,500.00	20.000	50.028	20.000	46.174	J-20	53.714
J-6	6,600.00	6,600.00	TRUE	13,500.00	20.000	49.703	20.000	45.199	J-20	53.898
J-7	6,600.00	6,600.00	TRUE	13,500.00	20.000	49.430	20.000	45.356	J-34	53.95
J-8	13,100.00	13,210.05	TRUE	13,500.00	20.000	48.765	20.000	45.348	J-34	54.267
J-9	6,600.00	6,600.00	TRUE	13,500.00	20.000	48.285	20.000	44.498	J-34	53.22
J-10	6,600.00	6,600.00	TRUE	13,500.00	20.000	49.885	20.000	44.202	J-34	54.435
J-11	6,600.00	6,600.00	TRUE	13,500.00	20.000	48.908	20.000	44.316	J-34	52.599
J-12	6,600.00	6,600.00	TRUE	13,500.00	20.000	50.710	20.000	44.886	J-34	54.013
J-13	6,600.00	6,600.00	TRUE	13,500.00	20.000	52.468	20.000	47.240	J-34	53.141
J-14	6,600.00	6,608.59	TRUE	13,500.00	20.000	53.203	20.000	47.765	J-34	53.203
J-15	6,600.00	6,600.00	TRUE	13,500.00	20.000	48.931	20.000	47.765	J-34	52.99
J-16	6,600.00	6,622.91	TRUE	13,500.00	20.000	48.085	20.000	47.765	J-34	52.99
J-17	6,600.00	6,600.00	TRUE	13,500.00	20.000	45.925	20.000	47.765	J-34	52.99
J-18	6,600.00	6,600.00	TRUE	13,500.00	20.000	28.155	20.000	35.487	J-19	50.498
J-19	6,600.00	6,660.13	TRUE	13,500.00	20.000	22.436	20.000	33.843	J-20	51.091
J-20	6,600.00	6,640.08	TRUE	13,500.00	20.000	25.550	20.000	35.344	J-19	48.736
J-21	6,600.00	6,634.36	TRUE	13,500.00	20.000	42.135	20.000	43.861	J-22	54.986
J-22	6,600.00	6,600.00	TRUE	13,500.00	20.000	41.960	20.000	43.892	J-21	54.986
J-23	6,600.00	6,608.59	TRUE	13,500.00	20.000	48.310	20.000	46.304	J-34	55.695
J-24	6,600.00	6,600.00	TRUE	13,500.00	20.000	29.881	20.000	30.972	J-25	55.998
J-25	6,600.00	6,634.36	TRUE	13,500.00	20.000	26.385	20.000	31.747	J-24	56.022
J-26	6,600.00	6,600.00	TRUE	7,581.89	20.000	20.000	20.000	24.893	J-28	55.931
J-27	6,600.00	6,600.00	TRUE	7,693.76	20.000	20.000	20.000	31.603	J-28	57.755
J-28	6,600.00	6,651.54	TRUE	7,379.11	20.000	20.000	20.000	26.165	J-26	56.891
J-29	6,600.00	6,600.00	TRUE	11,378.91	20.000	20.000	20.000	28.469	J-27	57.416
J-30	6,600.00	6,625.77	TRUE	13,500.00	20.000	28.280	20.000	29.312	J-29	57.373
J-31	6,600.00	6,600.00	TRUE	13,500.00	20.000	42.463	20.000	43.158	J-41	53.986
J-32	6,600.00	6,654.40	TRUE	9,516.73	20.000	20.000	20.000	46.097	J-34	53.402
J-33	6,600.00	6,645.81	TRUE	13,500.00	20.000	23.259	20.000	27.366	J-34	50.247
J-34	6,600.00	6,620.04	TRUE	11,893.97	20.000	20.000	20.000	27.508	J-35	47.765
J-35	6,600.00	6,622.91	TRUE	12,131.92	20.000	20.000	20.000	25.900	J-36	48.43
J-36	6,600.00	6,600.00	TRUE	12,893.13	20.000	20.000	20.000	20.851	J-35	50.257
J-37	6,600.00	6,640.08	TRUE	13,500.00	20.000	29.566	20.000	31.360	J-35	52.479
J-38	6,600.00	6,622.91	TRUE	12,917.14	20.000	20.000	20.000	24.285	J-39	53.597
J-39	6,600.00	6,600.00	TRUE	12,239.10	20.000	20.000	20.000	27.738	J-38	53.597
J-40	6,600.00	6,622.91	TRUE	13,500.00	20.000	38.920	20.000	43.541	J-42	54.803
J-41	6,600.00	6,600.00	TRUE	13,500.00	20.000	40.554	20.000	43.693	J-31	53.945
J-42	6,600.00	6,637.22	TRUE	13,500.00	20.000	36.668	20.000	42.633	J-40	56.433
J-43	6,600.00	6,600.00	TRUE	13,500.00	20.000	41.052	20.000	46.255	J-34	55.86
J-44	6,600.00	6,645.81	TRUE	8,750.46	20.000	20.000	20.000	46.960	J-34	56.751
J-45	6,600.00	6,660.13	TRUE	8,513.36	20.000	20.000	20.000	45.886	J-38	55.22
J-46	6,600.00	6,625.77	TRUE	13,500.00	20.000	46.824	20.000	44.270	J-51	56.41
J-47	6,600.00	6,628.63	TRUE	8,365.22	20.000	20.000	20.000	37.282	J-48	55.72
J-48	6,600.00	6,625.77	TRUE	8,729.19	20.000	20.000	20.000	35.370	J-47	55.681
J-49	6,600.00	6,622.91	TRUE	13,500.00	20.000	47.105	20.000	46.803	J-51	54.655
J-51	6,600.00	6,600.00	TRUE	13,500.00	20.000	40.023	20.000	44.280	J-67	53.856
J-52	6,600.00	6,608.59	TRUE	13,500.00	20.000	31.906	20.000	35.722	J-53	49.939
J-53	6,600.00	6,600.00	TRUE	13,500.00	20.000	35.722	20.000	34.870	J-52	50.79
J-54	10,200.00	10,225.48	TRUE	13,500.00	20.000	39.300	20.000	37.668	J-52	51.571
J-55	6,600.00	6,600.00	TRUE	13,500.00	20.000	44.100	20.000	41.972	J-52	52.067
J-56	6,600.00	6,628.53	TRUE	13,500.00	20.000	46.197	20.000	43.927	J-52	52.209
J-57	6,600.00	6,600.00	TRUE	13,500.00	20.000	50.358	20.000	47.401	J-52	52.919
J-58	6,600.00	6,600.00	TRUE	13,500.00	20.000	49.940	20.000	46.992	J-34	53.366
J-59	6,600.00	6,614.32	TRUE	13,500.00	20.000	49.451	20.000	46.947	J-34	54.046
J-60	6,600.00	6,600.00	TRUE	13,500.00	20.000	47.456	20.000	46.883	J-34	54.256
J-61	6,600.00	6,600.00	TRUE	13,500.00	20.000	46.331	20.000	45.233	J-51	55.307
J-63	6,600.00	6,640.08	TRUE	9,677.50	20.000	20.000	20.000	47.765	J-34	51.357
J-64	6,600.00	6,628.63	TRUE	7,370.06	20.000	20.000	20.000	47.352	J-34	53.761
J-65	6,600.00	6,872.00	TRUE	13,500.00	20.000	46.637	20.000	46.276	J-20	53.838
J-67	6,600.00	6,617.18	TRUE	13,500.00	20.000	40.263	20.000	40.023	J-51	58.112
J-68	6,600.00	6,600.00	TRUE	13,500.00	20.000	37.261	20.000	37.668	J-52	51.571

Analysis Results
Scenario: Max. Hour
Steady State Analysis

Title:
Project Engineer:
Project Date:
Comments:

Scenario Summary

Label	Max. Day
Demand Alternative	Demand-Max. Day
Physical Alternative	Base-Physical
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational
Age Alternative	Base-Age Alternative
Constituent Alternative	Base-Constituent
Trace Alternative	Base-Trace Alternative
Fire Flow Alternative	Base-Fire Flow

Liquid Characteristics

Liquid	Water at 20ºC (68ºF)	Specific Gravity	1.00
Kinematic Viscosity	0.1004e-5 m²/s		

Network Inventory

Number of Pipes	77	Number of Tanks	0
Number of Reservoirs	2	-Constant Area:	0
Number of Junctions	65	-Variable Area:	0
Number of Pumps	0	Number of Valves	0
-Constant Power:	0	-FCV's:	0
-One Point (Design Point):	0	-PBV's:	0
-Standard (3 Point):	0	-PRV's:	0
-Standard Extended:	0	-PSV's:	0
-Custom Extended:	0	-TCV's:	0
-Multiple Point:	0	Number of Spot Elevations	0

Pipe Inventory

Total Length	5,118.10 m		
150 mm	1,652.00 m	300 mm	1,794.00 m
200 mm	1,671.50 m	1200 mm	0.60 m

Junctions @ 0.00 hr

Label	Constituent (mg/l)	Calculated Hydraulic Grade (M)	Pressure (lbs./in²)	Demand (Calculated) (l/min.)	Pressure Head (m)
J-1	N/A	151.87	64.937	0.00	45.77
J-2	N/A	151.87	65.362	0.00	46.07
J-3	N/A	151.87	67.349	13.06	47.47
J-4	N/A	151.87	67.065	0.00	47.27
J-5	N/A	151.87	66.781	74.02	47.07
J-6	N/A	151.87	66.787	0.00	47.07
J-7	N/A	151.88	66.790	0.00	47.08
J-8	N/A	151.89	66.808	186.89	47.09
J-9	N/A	151.91	65.423	0.00	46.11
J-10	N/A	151.92	66.565	0.00	46.92
J-11	N/A	151.94	64.471	0.00	45.44
J-12	N/A	151.95	65.765	0.00	46.35
J-13	N/A	151.99	64.543	0.00	45.49
J-14	N/A	152.00	64.553	13.06	45.50
J-15	N/A	152.00	64.340	0.00	45.35
J-16	N/A	152.00	64.340	34.83	45.35

Analysis Results
Scenario: Max Hour
Steady State Analysis

Junctions @ 0.00 hr					
Label	**Constituent (mg/l)**	**Calculated Hydraulic Grade (M)**	**Pressure (lbs./in²)**	**Demand (Calculated) (l/min.)**	**Pressure Head (m)**
J-17	N/A	152.00	64.340	0.00	45.35
J-18	N/A	151.87	63.943	0.00	45.07
J-19	N/A	151.87	64.367	91.44	45.37
J-20	N/A	151.87	61.815	60.98	43.57
J-21	N/A	151.81	67.845	52.25	47.82
J-22	N/A	151.87	67.845	0.00	47.82
J-23	N/A	151.87	68.553	13.06	48.32
J-24	N/A	151.87	68.765	0.00	48.47
J-25	N/A	151.87	68.785	52.25	48.47
J-26	N/A	151.87	68.553	0.00	48.32
J-27	N/A	151.88	70.199	0.00	49.48
J-28	N/A	151.87	69.475	78.38	48.97
J-29	N/A	151.89	69.717	0.00	49.14
J-30	N/A	151.89	69.649	39.19	49.09
J-31	N/A	151.91	66.123	0.00	46.61
J-32	N/A	151.91	85.421	82.73	46.11
J-33	N/A	151.93	62.182	69.67	43.83
J-34	N/A	151.92	59.761	30.48	42.12
J-35	N/A	151.92	60.467	34.83	42.62
J-36	N/A	151.92	62.311	0.00	43.92
J-37	N/A	151.92	64.579	60.96	45.52
J-38	N/A	151.89	85.958	34.83	46.49
J-39	N/A	151.89	65.958	0.00	48.49
J-40	N/A	151.89	87.164	34.83	47.34
J-41	N/A	151.90	66.119	0.00	48.60
J-42	N/A	151.88	68.926.	58.60	48.58
J-43	N/A	151.87	68.628	0.00	48.37
J-44	N/A	151.87	69.267	69.67	48.82
J-45	N/A	151.87	67.846	91.44	47.82
J-46	N/A	151.96	68:036	39.19	47.96
J-47	N/A	151.95	67.326	43.54	47.45
J-48	N/A	151.96	67.259	39.19	47.41
J-49	N/A	151.97	66.207	34.83	48.87
J-51	N/A	151.96	65.482	0.00	48.18
J-52	N/A	152.00	81.288	13.06	43.20
J-53	N/A	152.00	62.140	0.00	43.80
J-54	N/A	152.00	62.920	41.86	44.35
J-55	N/A	152.00	63.417	0.00	44.70
J-56	N/A	152.00	63.559	43.54	44.80
J-57	N/A	152.00	64.269	0.00	45.30
J-58	N/A	151.98	64.814	0.00	45.68
J-59	N/A	151.98	65.517	21.77	46.18
J-60	N/A	151.97	85.786	0.00	46.37
J-61	N/A	151.96	66.906	0.00	47.16
J-63	N/A	152.00	62.705	80.96	44.20
J-64	N/A	151.98	65.231	43.54	45.98
J-66	N/A	151.87	66.777	413.65	47.07
J-67	N/A	151.96	69.738	26.13	49.16
J-68	N/A	152.00	62.920	0.00	44.35

Analysis Results
Scenario: Max Hour
Steady State Analysis

Reservoirs @ 0.00 hr

Label	Constituent (mg/l)	Calculated Hydraulic Grade (m)	Reservoir Inflow (l/min)	Reservoir Outflow (l/min)
R-1	N/A	152.00	0.00	0.00
R-3	N/A	152.00	N/A	2096.69

Pipes @ 0.00HR

Label	Status	Constituent (mg/l)	Flow (l/min)	Velocity (m/s)	From Grade (m)	To Grade (m)	Friction Loss (m)	Minor Loss (m)	Total Headloss (m)	Headloss Gradient (m/km)
P-3	Open	N/A	0.00	0.00	151.87	151.87	0.00	0.00	0.00	0.00
P-4	Open	N/A	0.00	0.00	151.87	151.87	0.00	0.00	0.00	0.00
P-5	Open	N/A	-52.15	0.01	151.87	151.87	0.29e-4	0.84e-5	0.37e-4	0.21e-2
P-6	Open	N/A	-52.15	0.01	151.87	151.87	0.14e-3	0.42e-5	0.14e-3	0.14e-2
P-7	Open	N/A	-322.63	0.08	151.87	151.87	0.36e-2	0.28e-3	0.41e-2	0.04
P-8	Open	N/A	-547.39	0.13	151.87	151.88	0.12e-2	0.76e-3	0.19e-2	0.17
P-9	Open	N/A	-547.39	0.13	151.88	151.89	0.01	0.64e-3	0.01	0.11
P-10	Open	N/A	-734.28	0.17	151.89	151.91	0.02	0.61e-3	0.02	0.19
P-11	Open	N/A	-734.28	0.17	151.91	151.92	0.35e-2	0.14e-2	0.49e-2	0.25
P-12	Open	N/A	-875.19	0.21	151.92	151.94	0.02	0.41e-2	0.02	0.3
P-13	Open	N/A	-1207.91	0.28	151.94	151.95	0.01	0.01	0.01	0.76
P-14	Open	N/A	-1207.91	0.28	151.95	151.99	0.03	0.01	0.04	0.56
P-15	Open	N/A	-1889.38	45.00	151.99	152.00	0.31e-2	0.35e-2	0.01	2.22
P-16	Open	N/A	66.44	0.02	152.00	152.00	0.14e-3	0.21e-4	0.16e-3	0.25-e2
P-17	Open	N/A	66.44	0.02	152.00	152.00	0.19e-4	0.88e-5	0.28e-4	0.27e-2
P-18	Open	N/A	0.00	0.00	152.00	152.00	0.00	0.00	0.00	0.00
P-19	Open	N/A	-13.06	0.31e-2	152.00	152.00	0.91e-5	0.22e-6	0.93e-5	0.2e-3
P-20	Open	N/A	-13.06	0.31e-2	152.00	152.00	-0.24e-6	0.24e-6	0.00	0.00
P-21	Open	N/A	-54.92	0.01	152.00	152.00	0.95e-4	0.75e-5	0.1e-3	0.16e-2
P-22	Open	N/A	-54.92	0.01	152.00	152.00	0.37e-4	0.93e-5	0.47e-4	0.23e-2
P-23	Open	N/A	-127.81	0.03	152.00	152.00	0.49e-3	0.34e-4	0.52e-3	0.01
P-24	Open	N/A	-127.81	0.03	152.00	152.00	0.27e-3	0.5e-4	0.32e-3	0.01
P-25	Open	N/A	681.47	0.16	151.99	151.98	0.01	0.97e-3	0.01	0.18
P-26	Open	N/A	681.47	0.16	151.98	151.98	0.28e-2	0.18e-2	0.46e-2	0.26
P-27	Open	N/A	616.16	0.15	151.98	151.97	0.01	0.8e-3	0.01	0.14
P-28	Open	N/A	616.16	0.15	151.97	151.97	0.25e-2	0.12e-2	0.37e-2	0.19
P-29	Open	N/A	504.72	0.12	151.97	151.96	0.01	0.53e-3	0.01	0.1
P-30	Open	N/A	504.72	0.12	151.96	151.96	0.23e-2	0.15e-2	0.37e-2	0.15
P-31	Open	N/A	26.13	0.01	151.96	151.96	0.26e-4	0.14e-5	0.28e-4	0.42e-3
P-33	Open	N/A	39.09	0.02	151.87	151.87	0.58e-3	0.26e-4	0.6e-3	0.01
P-34	Open	N/A	39.09	0.02	151.87	151.87	0.68e-3	0.77e-5	0.69e-3	0.01
P-35	Open	N/A	-52.35	0.03	151.87	151.87	0.11e-2	0.46e-4	0.12e-2	0.01
P-36	Open	N/A	-113.31	0.06	151.87	151.87	0.42e-2	0.21e-3	0.44e-2	0.04
P-37	Open	N/A	111.45	0.06	151.87	151.87	0.39e-2	0.44e-3	0.43e-2	0.04
P-38	Open	N/A	70.27	0.04	151.87	151.87	0.21e-3	0.52e-4	0.26e-3	0.02
P-39	Open	N/A	70.27	0.04	151.87	151.87	0.1e-2	0.77e-4	0.11e-2	0.02
P-40	Open	N/A	9.09	0.48e-2	151.87	151.87	0.35e-4	0.22e-5	0.37e-4	0.47e-3
P-41	Open	N/A	9.09	0.48e-2	151.87	151.87	0.8e-5	0.13e-5	0.93e-5	0.52e-3
P-42	Open	N/A	-3.93	0.37e-2	151.87	151.87	0.46e-4	0.76e-6	0.47e-4	0.45e-3
P-43	Open	N/A	-3.93	0.37e-2	151.87	151.87	0.9e-5	0.28e-6	0.93e-5	0.3e-3
P-44	Open	N/A	-82.31	0.08	151.87	151.88	0.01	0.11e-3	0.01	0.11
P-45	Open	N/A	-82.31	0.08	151.88	151.89	0.01	0.77e-4	0.01	0.11
P-46	Open	N/A	-82.31	0.08	151.89	151.89	0.14e-2	0.43e-3	0.18e-2	0.14
P-47	Open	N/A	-230.40	0.12	151.89	151.91	0.01	0.14e-2	0.01	0.17
P-48	Open	N/A	-54.00	0.05	151.91	151.91	0.49e-2	0.2e-3	0.01	0.05
P-49	Open	N/A	-136.73	0.13	151.91	151.94	0.03	0.11e-2	0.03	0.29
P-50	Open	N/A	195.99	0.10	151.94	151.93	0.01	0.68e-3	0.01	0.12

Analysis Results
Scenario: Max Hour
Steady State Analysis

Pipes @ 0.00hr

Label	Status	Constituent (mg/l)	Flow (l/min)	Velocity (m/s)	From Grade (m)	To Grade (m)	Friction Loss (m)	Minor Loss (m)	Total Headloss (m)	Headloss Gradient (m/km)
P-51	Open	N/A	126.32	0.07	151.93	151.92	0.01	0.14e-3	0.01	0.05
P-52	Open	N/A	95.84	0.05	151.92	151.92	0.26e-2	0.53e-4	0.26e-2	0.03
P-53	Open	N/A	61.01	0.03	151.92	151.92	0.46e-3	0.11e-4	0.47e-3	0.01
P-54	Open	N/A	61.01	0.03	151.92	151.92	0.13e-2	0.24e-4	0.13e-2	0.01
P-55	Open	N/A	0.05	0.29e-4	151.92	151.92	-0.64e-10	0.64e-10	0.00	0.00
P-56	Open	N/A	140.96	0.13	151.92	151.89	0.03	0.21e-2	0.03	0.32
P-57	Open	N/A	3.62	0.34e-2	151.89	151.89	-0.44e-6	0.44e-6	0.00	0.00
P-58	Open	N/A	3.62	0.34e-2	151.89	151.89	0.27e-4	0.12e-5	0.28e-4	0.42e-3
P-59	Open	N/A	169.07	0.09	151.87	151.87	0.22e-2	0.83e-3	0.31e-2	0.12
P-60	Open	N/A	169.07	0.09	151.88	151.87	0.01	0.21e-4	0.01	0.09
P-61	Open	N/A	225.67	0.12	151.89	151.88	0.01	0.83e-3	0.01	0.16
P-62	Open	N/A	-256.88	0.14	151.89	151.90	0.01	0.11e-2	0.01	0.20
P-63	Open	N/A	-256.88	0.14	151.90	151.91	0.17e-2	0.89e-3	0.26e-2	0.29
P-64	Open	N/A	-433.28	0.23	151.91	151.96	0.04	0.01	0.05	0.57
P-65	Open	N/A	6.12	0.01	151.96	151.95	0.89e-4	0.39e-5	0.93e-4	0.93e-3
P-66	Open	N/A	37.42	0.04	151.95	151.96	0.26e-2	0.25e-4	0.26e-2	0.03
P-67	Open	N/A	-76.61	0.07	151.96	151.97	0.01	0.59e-3	0.01	0.10
P-68	Open	N/A	43.54	0.04	151.98	151.98	0.13e-2	0.17e-3	0.15e-2	0.04
P-71	Open	N/A	31.61	0.03	152.00	152.00	0.2e-2	0.87e-4	0.21e-2	0.02
P-72	Open	N/A	-29.35	0.03	152.00	152.00	0.13e-2	0.87e-4	0.14e-2	0.02
P-73	Open	N/A	11.07	0.01	151.87	151.87	0.33e-3	0.12e-4	0.34e-3	0.28e-2
P-74	Open	N/A	102.51	0.10	151.89	151.87	0.02	0.82e-3	0.02	0.17
P-75	Open	N/A	-39.23	0.04	151.87	151.87	0.31e-2	0.12e-3	0.33e-2	0.03
P-76	Open	N/A	-108.90	0.10	151.87	151.89	0.02	0.11e-2	0.02	0.20
P-151	Open	N/A	196.47	0.05	151.87	151.87	0.31e-2	0.22e-3	0.33e-2	0.02
P-152	Open	N/A	-217.18	0.05	151.87	151.87	0.15e-2	0.27e-3	0.17e-2	0.02
P-154	Open	N/A	-26.13	0.01	151.96	151.96	0.27e-4	0.68e-6	0.28e-4	0.42e-3
P-155	Open	N/A	-0.18e-2	0.42e-6	152.00	152.00	-0.1e-13	0.1e-13	0.00	0.00
P-156	Open	N/A	2,097	0.03	152.00	152.00	0.00	0.00	0.00	0.00
P-157	Closed	N/A	0.00	0.00	152.00	151.87	0.00	0.00	0.00	0.00

Scenario: Max. Hour
Steady State Analysis
Pipe Report

Link Label	Length (m)	Dia. (mm)	Material	Roughness	Minor Loss	Initial Status	Current Status	Discharge (l/min)	Velocity (m/s)	Start Hydraulic Grade (m)	End Hydraulic Grade (m)	Headloss (m)	Friction Slope (m/km)	Travel Time (min)
P-3	8.00	300	PVC	110.0	0.76	Open	Open	0.00	0.00	151.87	151.87	0.00	0.00	N/A
P-4	55.50	300	PVC	110.0	2.02	Open	Open	0.00	0.00	151.87	151.87	0.00	0.00	N/A
P-5	18.00	300	PVC	110.0	1.09	Open	Open	-52.15	0.01	151.87	151.87	0.37e-3	0.21e-2	24.40
P-33	100.50	200	PVC	110.0	1.18	Open	Open	39.09	0.02	151.87	151.87	0.6e-3	0.01	80.78
P-6	102.00	300	PVC	110.0	0.55	Open	Open	-52.15	0.01	151.87	151.87	0.14e-3	0.14e-2	138.26
P-7	97.00	300	PVC	110.0	0.94	Open	Open	-322.63	0.08	151.87	151.87	0.41e-2	0.04	21.25
P-151	194.00	300	PVC	110.0	2.04	Open	Open	196.47	0.05	151.87	151.87	0.33e-2	0.02	69.80
P-8	11.00	300	PVC	110.0	0.89	Open	Open	-547.39	0.13	151.87	151.88	0.19e-2	0.17	1.42
P-37	97.50	200	PVC	110.0	2.48	Open	Open	111.45	0.06	151.87	151.87	0.43e-2	0.04	27.48
P-9	115.00	300	PVC	110.0	0.75	Open	Open	-547.39	0.13	151.88	151.89	0.01	0.11	14.85
P-10	129.00	300	PVC	110.0	0.40	Open	Open	-734.28	0.17	151.89	151.91	0.02	0.19	12.42
P-11	19.50	300	PVC	110.0	0.89	Open	Open	-734.28	0.17	151.91	151.92	0.49e-2	0.25	1.88
P-12	79.00	300	PVC	110.0	1.88	Open	Open	-875.19	0.21	151.92	151.94	0.02	0.30	6.38
P-56	87.50	150	PVC	100.0	2.28	Open	Open	140.96	0.13	151.92	151.89	0.03	0.32	10.97
P-13	16.50	30	PVC	110.0	1.24	Open	Open	-1,207.91	0.28	151.94	151.95	0.01	0.76	0.97
P-50	111.00	200	PVC	110.0	1.24	Open	Open	195.99	0.10	151.94	151.93	0.01	0.12	17.79
P-14	69.50	300	PVC	110.0	1.72	Open	Open	-1,207.91	0.28	151.95	151.99	0.04	0.58	4.07
P-15	3.00	300	PVC	110.0	0.35	Open	Open	-1,889.38	0.45	151.99	152.00	0.01	2.22	0.11
P-25	52.50	300	PVC	110.0	0.74	Open	Open	681.47	16.00	151.99	151.98	0.01	0.18	5.45
P-16	63.00	300	PVC	110.0	1.67	Open	Open	66.44	0.02	152.00	152.00	0.16e-3	0.25e-2	67.03
P-17	10.50	300	PVC	110.0	0.70	Open	Open	66.44	0.02	152.00	152.00	0.28e-4	0.27e-2	11.17
P-18	34.00	300	PVC	110.0	0.35	Open	Open	0.00	0.00	152.00	152.00	0.00	0.00	N/A
P-71	105.50	150	PVC	100.0	1.92	Open	Open	31.61	0.03	152.00	152.00	0.21e-2	0.02	58.98
P-34	120.00	200	PVC	110.0	0.35	Open	Open	39.09	0.02	151.87	151.87	0.69e-3	0.01	96.45
P-35	115.50	200	PVC	110.0	1.18	Open	Open	-52.35	0.03	151.87	151.87	0.12e-2	0.01	69.31
P-36	102.00	200	PVC	110.0	1.14	Open	Open	-113.31	0.06	151.87	151.87	0.44e-2	0.04	28.28
P-38	12.00	200	PVC	110.0	0.74	Open	Open	70.27	0.04	151.87	151.87	0.26e-3	0.02	5.37
P-39	59.50	200	PVC	110.0	1.09	Open	Open	70.27	0.04	151.87	151.87	0.11e-2	0.02	26.60
P-40	78.50	200	PVC	110.0	1.83	Open	Open	9.09	0.48e-2	151.87	151.87	0.37e-4	0.47e-3	271.19
P-41	18.00	200	PVC	110.0	1.09	Open	Open	9.09	0.48e-2	151.87	151.87	0.93e-5	0.52e-3	62.18
P-42	102.50	150	PVC	100.0	1.09	Open	Open	-3.93	0.37e-2	151.87	151.87	0.47e-4	0.45e-3	461.30
P-75	112.50	150	PVC	100.0	1.72	Open	Open	-39.23	0.04	151.87	151.87	0.33e-2	0.03	50.68
P-43	31.00	150	PVC	100.0	0.40	Open	Open	-3.93	0.37e-2	151.87	151.87	0.93e-5	0.3e-3	139.52
P-45	95.00	150	PVC	100.0	0.25	Open	Open	-82.31	0.08	151.88	151.89	0.01	0.11	20.40
P-44	93.00	150	PVC	100.0	0.35	Open	Open	-82.31	0.08	151.87	151.88	0.01	0.11	19.97
P-46	12.50	150	PVC	100.0	1.39	Open	Open	-82.31	0.08	151.89	151.89	0.18e-2	0.14	2.68
P-47	86.50	200	PVC	110.0	1.88	Open	Open	230.40	0.12	151.89	151.91	0.01	0.17	11.79
P-48	98.00	150	PVC	100.0	1.49	Open	Open	-54.00	0.05	151.91	151.91	0.01	0.05	32.07
P-64	85.00	200	PVC	110.0	2.56	Open	Open	-433.28	0.23	151.91	151.96	0.05	0.57	6.16
P-49	104.50	150	PVC	100.0	1.29	Open	Open	-136.73	0.13	151.91	151.94	0.03	0.29	13.51

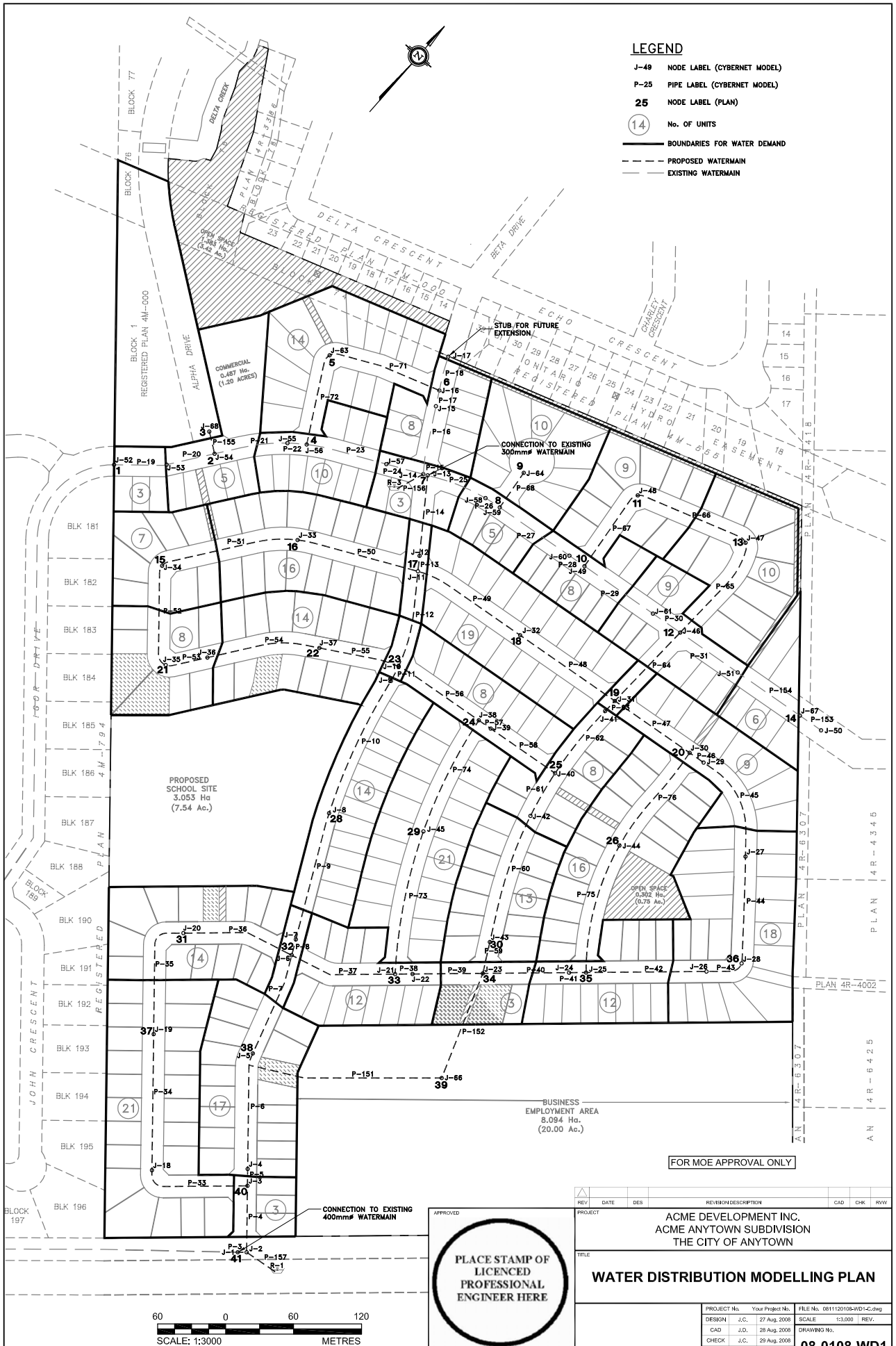
Scenario: Max. Hour
Steady State Analysis
Pipe Report

Link Label	Length (m)	Dia. (mm)	Material	Roughness	Minor Loss	Initial Status	Current Status	Discharge (l/min)	Velocity (m/s)	Start Hydraulic Grade (m)	End Hydraulic Grade (m)	Headloss (m)	Friction Slope (m/km)	Travel Time (min)
P-51	120.00	200	PVC	110.0	0.60	Open	Open	126.32	0.07	151.93	151.92	0.01	0.05	29.84
P-52	85.00	200	PVC	110.0	0.40	Open	Open	95.84	0.05	151.92	151.92	0.26e-2	0.03	27.86
P-53	35.50	200	PVC	110.0	0.20	Open	Open	61.01	0.03	151.92	151.92	0.47e-3	0.01	18.28
P-54	102.00	200	PVC	110.0	0.45	Open	Open	61.01	0.03	151.92	151.92	0.13e-2	0.01	52.52
P-55	75.00	200	PVC	110.0	1.54	Open	Open	0.05	0.29e-4	151.92	151.92	0.00	0.00	3759.69
P-57	10.00	150	PVC	100.0	0.74	Open	Open	3.62	0.34e-2	151.89	151.89	0.00	0.00	48.79
P-74	112.00	150	PVC	100.0	1.72	Open	Open	102.51	0.10	151.89	151.87	0.02	0.17	19.31
P-58	66.00	150	PVC	100.0	2.02	Open	Open	3.62	0.34e-2	151.89	151.89	0.28e-4	0.42e-3	322.00
P-62	68.00	200	PVC	110.0	1.14	Open	Open	-256.88	0.14	151.89	151.90	0.01	0.20	8.32
P-61	47.00	200	PVC	110.0	1.14	Open	Open	225.67	0.12	151.89	151.88	0.01	0.16	6.54
P-63	9.00	200	PVC	110.0	0.94	Open	Open	-256.88	0.14	151.90	151.91	0.26e-2	0.29	1.10
P-60	118.00	200	PVC	110.0	0.05	Open	Open	169.07	0.09	151.88	151.87	0.01	0.09	21.93
P-59	26.00	200	PVC	110.0	2.02	Open	Open	169.07	0.09	151.87	151.87	0.31e-2	0.12	4.83
P-76	99.50	150	PVC	100.0	2.02	Open	Open	-108.90	0.10	151.87	151.89	0.02	0.20	16.15
P-73	124.50	150	PVC	100.0	2.07	Open	Open	11.07	0.01	151.87	151.87	0.34e-3	0.28e-2	198.72
P-31	66.00	300	PVC	110.0	0.74	Open	Open	26.13	0.01	151.96	151.96	0.28e-4	0.42e-3	178.54
P-65	99.50	150	PVC	100.0	2.27	Open	Open	6.12	0.01	151.96	151.95	0.93e-4	0.93e-3	287.08
P-66	101.00	150	PVC	100.0	0.40	Open	Open	-37.42	0.04	151.95	151.96	0.26e-3	0.03	47.70
P-67	78.00	150	PVC	100.0	2.22	Open	Open	-76.61	0.07	151.96	151.97	0.01	0.10	17.99
P-29	70.50	300	PVC	110.0	0.74	Open	Open	504.72	0.12	151.97	151.96	0.01	0.10	9.87
P-19	47.00	300	PVC	110.0	0.45	Open	Open	-13.06	0.13e-2	152.00	152.00	0.93e-5	0.2e-3	254.38
P-20	43.50	300	PVC	110.0	0.49	Open	Open	-13.06	0.13e-2	152.00	152.00	0.00	0.00	235.44
P-21	65.00	300	PVC	100.0	0.88	Open	Open	-54.92	0.01	152.00	152.00	0.1e-3	0.16e-2	83.66
P-155	21.50	300	PVC	110.0	1.14	Open	Open	0.18e-2	0.42e-6	152.00	152.00	0.00	0.00	8066.28
P-22	20.50	300	PVC	110.0	1.09	Open	Open	-54.92	0.01	152.00	152.00	0.47e-4	0.23e-2	26.38
P-23	69.00	300	PVC	110.0	0.74	Open	Open	-127.81	0.03	152.00	152.00	0.52e-3	0.01	38.16
P-24	37.00	300	PVC	110.0	1.09	Open	Open	-127.81	0.03	152.00	152.00	0.32e-3	0.01	20.46
P-26	17.50	300	PVC	110.0	1.39	Open	Open	681.47	0.16	151.98	151.98	0.46e-2	0.26	1.82
P-27	72.00	300	PVC	110.0	0.74	Open	Open	616.16	0.15	151.98	151.97	0.00	0.14	8.26
P-68	38.50	150	PVC	100.0	2.02	Open	Open	43.54	0.04	151.98	151.98	0.15e-2	0.04	15.63
P-28	19.00	300	PVC	110.0	1.09	Open	Open	616.16	0.15	151.97	151.97	0.37e-2	0.19	2.18
P-30	25.00	300	PVC	110.0	2.02	Open	Open	504.72	0.12	151.96	151.96	0.37e-2	0.15	3.50
P-72	81.00	150	PVC	100.0	2.22	Open	Open	-29.35	0.03	152.00	152.00	0.14e-2	0.02	48.77
P-152	76.50	300	PVC	110.0	2.04	Open	Open	-217.18	0.05	151.87	151.87	0.17e-2	0.02	24.90
P-154	67.00	300	PVC	110.0	0.35	Open	Open	-26.13	0.01	151.96	151.96	0.28e-4	0.42e-3	181.25
P-156	0.30	1,200	PVC	150.0	0.00	Open	Open	2,096.69	0.03	152.00	152.00	0.00	0.00	0.18
P-157	0.30	1,200	PVC	150.0	0.00	Closed	Closed	0.00	0.00	152.00	151.87	0.00	0.00	N/A

TABLE 5.1: Values of *C* in Formula *Q* = *CLH3/2* for Broad-Crested Weirs

Measured	Breadth of Crest of Weir, m										
head, m	0.15	0.2	0.3	0.45	0.6	0.75	0.9	1.2	1.5	3	4.5
0.1	1.61	1.55	1.5	1.46	1.44	1.44	1.43	1.4	1.38	1.41	1.49
0.2	1.7	1.6	1.52	1.46	1.44	1.44	1.48	1.49	1.49	1.49	1.49
0.3	1.83	1.73	1.65	1.52	1.47	1.46	1.46	1.48	1.48	1.48	1.45
0.4	1.83	1.8	1.77	1.61	1.53	1.48	1.46	1.46	1.46	1.48	1.46
0.5	1.83	1.82	1.81	1.7	1.6	1.52	1.48	1.47	1.46	1.46	1.45
0.6	1.83	1.83	1.82	1.67	1.57	1.52	1.5	1.48	1.46	1.46	1.45
0.8	1.83	1.83	1.83	1.81	1.7	1.6	1.55	1.5	1.48	1.46	1.45
0.9	1.83	1.83	1.83	1.83	1.77	1.69	1.61	1.51	1.47	1.46	1.45
1.0	1.83	1.83	1.83	1.83	1.83	1.76	1.64	1.52	1.48	1.46	1.45
1.2	1.83	1.83	1.83	1.83	1.83	1.83	1.7	1.54	1.49	1.46	1.45
1.4	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.59	1.51	1.46	1.45
1.5	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.7	1.54	1.46	1.45
1.7	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.59	1.46	1.45

PLOT DATE: February 26, 2009
FILENAME: N:\Active\2008\1112\08-1112-0108 ACME MOE\Residential Services\ACAD\FEB 21 2009 (UPDATE)\0811120108-WD1-C.dwg



REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

APPROVED

PLACE STAMP OF LICENCED PROFESSIONAL ENGINEER HERE

PROJECT

ACME DEVELOPMENT INC.
ACME ANYTOWN SUBDIVISION
THE CITY OF ANYTOWN

TITLE

WATER DISTRIBUTION MODELLING PLAN

PROJECT No.	Your Project No.		FILE No. 0811120108-WD1-C.dwg
DESIGN	J.C.	27 Aug, 2008	SCALE 1:3,000 REV.
CAD	J.D.	28 Aug, 2008	DRAWING No.
CHECK	J.C.	29 Aug, 2008	08-0108-WD1
REVIEW	P.M.	30 Aug, 2008	

APPENDIX B

Sanitary Sewer Calculations

File No.: 08-XXXX
Project: ACME Developments Subdivision
Date: Sept 8, 2008

Sanitary Calculation Sheet

Consulting Ltd.

Design Flows:

Average Residential Flow:	350	L / cap / day
Average Commercial Flow:	35000	L / ha / day
Average Institutional Flow:	35000	L / ha / day
Average Light Industrial Flow:	45000	L / ha / day

Peak Factors:

Peak Residential Factor (Harmon): $1 + 14 / (4 + P^{1/2})$, MAX = 4.0, MIN = 2.0

Peak Commercial/Institutional Factor:

less than 2.0 ha =	5	times average flow
2.1 to 10 ha =	4	times average flow
10.1 to 20 ha =	3.5	times average flow
20.1 to 60 ha =	3	times average flow
20.1 to 200 ha =	2.5	times average flow
greater than 200 ha =	2	times average flow

Infiltration Allowance:

Infiltration 0.28 L/s/ha

Population Densities:

Single and semi-detached		4	Persons / Unit
Townhouses		2.5	Persons / Unit
Apartments:	Bachelor	1	Persons / Unit
	1 Bedroom	2	Persons / Unit
	2 Bedroom	3	Persons / Unit
	3 Bedroom	4	Persons / Unit
	Average	2.4	Persons / Unit

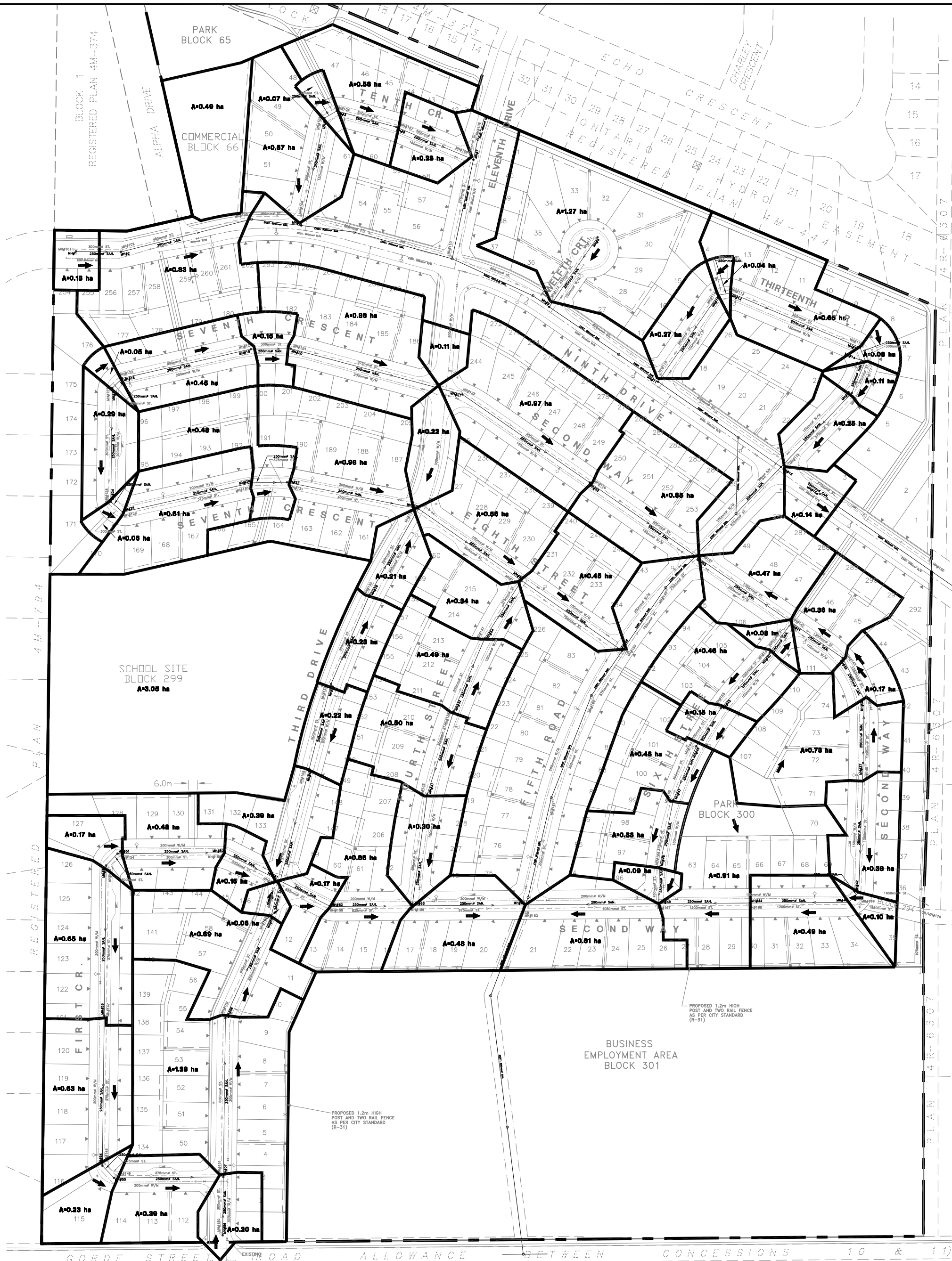
Location					Drainage Area		Residential						Commercial				Institutional				Design Flow Rate			Pipe Selection					
Street	From		To		A	Cumul. A	Units	Population	Cumulative Residential Population	Avg. Flow L/s	Peak Factor	Peak Flow L/s	Area	Avg. Flow L / s	Peak Factor	Peak Flow L / s	Area	Avg. Flow L / s	Peak Factor	Peak Flow L / s	Design Flow L/s	Infiltration Allowance L/s	Total Flow L/s	Dia.	So	Pipe Length	Rough Coeff.	Velocity (full)	Pipe Capacity (full)
	MH No.	Sta.	MH No.	Sta.	ha	ha	Singles						ha				ha							mm	m/m	m	n	m/s	L/s
Ninth Drive	1		2		0.13	0.13	2	8.0	8.0	0.03	4.0	0.13									0.13	0.04	0.17	250	0.0165	31	0.013	1.56	76.39
Ninth Drive	2		exist.		0.83	0.96	7	28.0	36.0	0.15	4.0	0.58	0.49	0.20	5.00	0.99					1.58	0.41	1.98	250	0.005	94	0.013	0.86	42.05
*																													
Tenth Crescent	4		5		0.57	0.57	4	16.0	16.0	0.06	4.0	0.26									0.26	0.16	0.42	250	0.0091	75.5	0.013	1.16	56.73
*																													
Tenth Crescent	4		3		0.07	0.07	1	4.0	4.0	0.02	4.0	0.06									0.06	0.02	0.08	250	0.01	10	0.013	1.21	59.47
Tenth Crescent	3		6		0.56	0.63	5	20.0	24.0	0.10	4.0	0.39									0.39	0.18	0.57	250	0.0061	42.5	0.013	0.95	46.45
Tenth Crescent	6		7		0.23	0.86	4	16.0	40.0	0.16	4.0	0.65									0.65	0.24	0.89	250	0.004	58	0.013	0.77	37.61
*																													
Twelfth Court	8		9		1.27	1.27	10	40.0	40.0	0.16	4.0	0.65									0.65	0.36	1.00	250	0.004	58.5	0.013	0.77	37.61
*																													
Thirteenth Crescent	15		10		0.04	0.04	1	4.0	4.0	0.02	4.0	0.06									0.06	0.01	0.08	250	0.006	9	0.013	0.94	46.06
Thirteenth Crescent	10		11		0.27	0.31	3	12.0	16.0	0.06	4.0	0.26									0.26	0.09	0.35	250	0.004	72.5	0.013	0.77	37.61
*																													
Thirteenth Crescent	12		13		0.66	0.66	9	36.0	36.0	0.15	4.0	0.58									0.58	0.18	0.77	250	0.0043	97	0.013	0.79	39.00
Thirteenth Crescent	13		14		0.08	0.74	2	8.0	44.0	0.18	4.0	0.71									0.71	0.21	0.92	250	0.004	10	0.013	0.77	37.61
Thirteenth Crescent	14		15		0.11	0.85	1	4.0	48.0	0.19	4.0	0.78									0.78	0.24	1.02	250	0.0046	24	0.013	0.82	40.33
Thirteenth Crescent	15		16		0.25	1.10	3	12.0	60.0	0.24	4.0	0.97									0.97	0.31	1.28	250	0.004	71	0.013	0.77	37.61
*																													
Ninth Drive	16a		exist.		0.14	0.14	3	12.0	12.0	0.05	4.0	0.19									0.19	0.04	0.23	250	0.004	23	0.013	0.77	37.61
*																													
Seventh Crescent	17		18		0.05	0.05	1	4.0	4.0	0.02	4.0	0.06									0.06	0.01	0.08	250	0.015	10	0.013	1.48	72.83
Seventh Crescent	18		19		0.45	0.50	8	32.0	36.0	0.15	4.0	0.58									0.58	0.14	0.72	250	0.012	90.5	0.013	1.33	65.14
Seventh Crescent	19		20		0.15	0.65	3	12.0	48.0	0.19	4.0	0.78									0.78	0.18	0.96	250	0.01	30	0.013	1.21	59.47
Seventh Crescent	20		21		0.97	1.62	9	36.0	84.0	0.34	4.0	1.36									1.36	0.45	1.81	250	0.0059	120	0.013	0.93	45.68
Second Way	21		22		0.97	2.59	11	44.0	128.0	0.52	4.0	2.07									2.07	0.73	2.80	250	0.0106	106.5	0.013	1.25	61.23
Second Way	22		23		0.65	3.24	8	32.0	160.0	0.65	4.0	2.59									2.59	0.91	3.50	250	0.016	88.5	0.013	1.53	75.22
*																													
Seventh Crescent	17		24		0.29	0.29	5	20.0	20.0	0.08	4.0	0.32									0.32	0.08	0.41	250	0.004	78.5	0.013	0.77	37.61
Seventh Crescent	24		25		0.06	0.35	1	4.0	24.0	0.10	4.0	0.39									0.39	0.10	0.49	250	0.004	11	0.013	0.77	37.61
Seventh Crescent	25		26		0.61	0.96	8	32.0	56.0	0.23	4.0	0.91									0.91	0.27	1.18	250	0.0095	91	0.013	1.18	57.96
Seventh Crescent	26		27		0.48	1.44	3	12.0	68.0	0.28	4.0	1.10									1.10	0.40	1.51	250	0.0261	24.5	0.013	1.96	96.07
Seventh Crescent	27		30		0.98	2.42	7	28.0	96.0	0.39	4.0	1.56									1.56	0.68	2.23	250	0.008	90.5	0.013	1.08	53.19
Eighth Street	30		35		1.22	3.64	12	48.0	144.0	0.58	4.0	2.33									2.33	1.02	3.35	250	0.004	87.5	0.013	0.77	37.61
Eighth Street	35		36		1.28	4.92	20	80.0	224.0	0.91	4.0	3.63									3.63	1.38	5.01	250	0.004	84.5	0.013	0.77	37.61
*																													
Third Drive	28		29		0.23	0.23	5	20.0	20.0	0.08	4.0	0.32									0.32	0.06	0.39	250	0.004	67.5	0.013	0.77	37.61
Third Drive	29		30		0.21	0.44	3	12.0	32.0	0.13	4.0	0.52									0.52	0.12	0.64	250	0.004	68	0.013	0.77	37.61
*																													
Third Drive	28		60		0.22	0.22	4	16.0	16.0	0.06	4.0	0.26									0.26	0.06	0.32	250	0.0088	60	0.013	1.14	55.79
Third Drive	60		61		0.39	0.61	2	8.0	24.0	0.10	4.0	0.39					3.05	1.24	4.00	4.95	5.34	1.03	6.36	250	0.004	79.5	0.013	0.77	37.61
*																													
Third Drive	56		57		0.2	0.20	2	8.0	8.0	0.03	4.0	0.13									0.13	0.06	0.19	250	0.004	32	0.013	0.77	37.61
*																													
Fourth Street	32		31		0.5	0.50	6	24.0	24.0	0.10	4.0	0.39									0.39	0.14	0.53	250	0.0061	60.5	0.013	0.95	46.45
Fourth Street	31		63		0.3	0.80	5	20.0	44.0	0.18	4.0	0.71									0.71	0.22	0.94	250	0.0058	78	0.013	0.92	45.29
*																													
Fourth Street	32		34		0.49	0.49	7	28.0	28.0	0.11	4.0	0.45									0.45	0.14	0.59	250	0.004	54.5	0.013	0.77	37.61
Fourth Street	34		35		0.34	0.83	3	12.0	40.0	0.16	4.0	0.65									0.65	0.23	0.88	250	0.004	47.5	0.013	0.77	37.61
*																													

File No.: 08-XXXX
Project: ACME Developments Subdivision
Date: Sept 8, 2008

Sanitary Calculation Sheet

Consulting Ltd.

Location					Drainage Area		Residential						Commercial				Institutional				Design Flow Rate			Pipe Selection					
Street	From		To		A	Cumul. A	Units	Population	Cumulative Residential Population	Avg. Flow L/s	Peak Factor	Peak Flow L/s	Area	Avg. Flow L / s	Peak Factor	Peak Flow L / s	Area	Avg. Flow L / s	Peak Factor	Peak Flow L / s	Design Flow L/s	Infiltration Allowance L/s	Total Flow L/s	Dia.	So	Pipe Length	Rough Coeff.	Velocity (full)	Pipe Capacity (full)
	MH No.	Sta.	MH No.	Sta.	ha	ha	Singles						ha				ha							mm	m/m	m	n	m/s	L/s
Second Way	37		38		0.73	0.73	5	20.0	20.0	0.08	4.0	0.32									0.32	0.20	0.53	250	0.003	44	0.013	0.66	32.57
Second Way	38		39		0.17	0.90	3	12.0	32.0	0.13	4.0	0.52									0.52	0.25	0.77	250	0.003	31.5	0.013	0.66	32.57
Second Way	39		41		0.36	1.26	2	8.0	40.0	0.16	4.0	0.65									0.65	0.35	1.00	250	0.003	43	0.013	0.66	32.57
Second Way	41		23		0.55	1.81	5	20.0	60.0	0.24	4.0	0.97									0.97	0.51	1.48	250	0.003	80.5	0.013	0.66	32.57
*																									0.003				
Second Way	37		42		0.38	0.38	6	24.0	24.0	0.10	4.0	0.39									0.39	0.11	0.50	250	0.003	89	0.013	0.66	32.57
Second Way	42		43		0.1	0.48	1	4.0	28.0	0.11	4.0	0.45									0.45	0.13	0.59	250	0.003	10	0.013	0.66	32.57
Second Way	43		44		0.49	0.97	9	36.0	64.0	0.26	4.0	1.04									1.04	0.27	1.31	250	0.003	65.5	0.013	0.66	32.57
Second Way	44		49		0.91	1.88	7	28.0	92.0	0.37	4.0	1.49									1.49	0.53	2.02	250	0.003	65	0.013	0.66	32.57
Second Way	49		64		2.07	3.95	19	76.0	168.0	0.68	4.0	2.72									2.72	1.11	3.83	250	0.003	92	0.013	0.66	32.57
*																													
First Crescent	50		53		0.65	0.65	10	40.0	40.0	0.16	4.0	0.65									0.65	0.18	0.83	250	0.0113	102.5	0.013	1.29	63.21
First Crescent	53		54		0.63	1.28	9	36.0	76.0	0.31	4.0	1.23									1.23	0.36	1.59	250	0.0078	104	0.013	1.07	52.52
First Crescent	54		55		0.23	1.51	1	4.0	80.0	0.32	4.0	1.30									1.30	0.42	1.72	250	0.0119	11	0.013	1.32	64.87
First Crescent	55		57		0.39	1.90	3	12.0	92.0	0.37	4.0	1.49									1.49	0.53	2.02	250	0.0052	74.5	0.013	0.87	42.88
Third Drive	57		58		1.58	3.48	14	73.5	165.5	0.67	4.0	2.68									2.68	0.97	3.66	250	0.003	110	0.013	0.66	32.57
Third Drive	58		59		0.69	4.17	6	79.0	244.5	0.99	4.0	3.96									3.96	1.17	5.13	250	0.003	77	0.013	0.66	32.57
Third Drive	59		61		0.06	4.23	0	12.5	257.0	1.04	4.0	4.16									4.16	1.18	5.35	250	0.003	25	0.013	0.66	32.57
Second Way	61		62		1.58	5.81	22	145.5	402.5	1.63	4.0	6.52					3.05	1.24	4.00	4.95	11.47	2.48	13.95	250	0.003	39	0.013	0.66	32.57
Second Way	62		63		0.66	6.47	5	42.5	445.0	1.80	4.0	7.21					3.05	1.24	4.00	4.95	12.16	2.67	14.82	250	0.003	56.5	0.013	0.66	32.57
Second Way	63		64		1.28	7.75	9	38.5	483.5	1.96	4.0	7.80					3.05	1.24	4.00	4.95	12.75	3.02	15.77	250	0.003	78	0.013	0.66	32.57
*																													
First Crescent	50		51		0.17	0.17	1	4.0	4.0	0.02	4.0	0.06									0.06	0.05	0.11	250	0.0343	11	0.013	2.24	110.14
First Crescent	51		52		0.48	0.65	7	28.0	32.0	0.13	4.0	0.52									0.52	0.18	0.70	250	0.0343	73.5	0.013	2.24	110.14
First Crescent	52		53		0.15	0.80	4	16.0	48.0	0.19	4.0	0.78									0.78	0.22	1.00	250	0.0095	42	0.013	1.18	57.96
*																													
Sixth Street	40		41		0.08	0.08	2	8.0	8.0	0.03	4.0	0.13									0.13	0.02	0.15	250	0.0075	25.5	0.013	1.05	51.50
*																													
Sixth Street	40		45		0.46	0.46	6	24.0	24.0	0.10	4.0	0.39									0.39	0.13	0.52	250	0.003	51	0.013	0.66	32.57
Sixth Street	45		46		0.15	0.61	2	8.0	32.0	0.13	4.0	0.52									0.52	0.17	0.69	250	0.003	31.5	0.013	0.66	32.57
Sixth Street	46		47		0.43	1.04	2	8.0	40.0	0.16	4.0	0.65									0.65	0.29	0.94	250	0.003	40	0.013	0.66	32.57
Sixth Street	47		48		0.33	1.37	3	12.0	52.0	0.21	4.0	0.84									0.84	0.38	1.23	250	0.003	47.5	0.013	0.66	32.57
Sixth Street	48		49		0.09	1.46	1	4.0	56.0	0.23	4.0	0.91									0.91	0.41	1.32	250	0.003	25	0.013	0.66	32.57
*																													



LEGEND:

- PROPOSED SANITARY MANHOLE
- PROPOSED CATCH-BASIN
- PROPOSED STORM MANHOLE
- EXISTING SANITARY SEWER AND MH
- EXISTING WATERMAIN AND HYDRANT
- PROPOSED WATER VALVE
- PROPOSED SANITARY SEWER
- PROPOSED WATERMAIN
- PROPOSED STORM SEWER
- PROPOSED STREET LIGHT (TYPICAL AS PER GOULBOURN STANDARD R-25 TYPE A)
- COMMUNITY MAIL BOX LOCATION
- HYDRANT AND VALVE
- PROPOSED BUILDING SERVICE LATERAL (SEE DETAIL DRAWING No. 94-1029-DS1) 1-20mmØ WATER 1-100mmØ STORM 1-125mmØ SANITARY
- 13 LOT NUMBER
- PROPOSED EASEMENT
- A=0.45 AREA IN HECTARES
- FLOW DIRECTION
- AREA BOUNDARY
- PROPERTY LINE

30 0 30 60
SCALE: 1:1500 METRES

NOTE: 1:1,500 SCALE ON ORIGINAL 'D' SIZE DRAWING

FOR MOE APPROVAL ONLY

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

APPROVED — PLACE STAMP OF LICENCED PROFESSIONAL ENGINEER HERE
APPROVED
APPROVED

PROJECT
ACME DEVELOPMENT INC.
ACME ANYTOWN SUBDIVISION
THE CITY OF ANYTOWN

TITLE
SANITARY DRAINAGE AREA PLAN

PROJECT No.	Your Project No.		FILE No. 0811220108-SA1.dwg	
DESIGN	J.C.	27 Aug. 2008	SCALE 1:1,500	REV.
CAD	J.D.	28 Aug. 2008	FIGURE	
CHECK	J.C.	29 Aug. 2008	08-0108-SA1	
REVIEW	P.M.	30 Aug. 2008		

PLOT DATE: June 3, 2009

APPENDIX C

Storm Sewer Calculations

Pipe Flow				
Input:				
Manning roughness coefficient:			0.013	
Pipe Diameter (m):			0.5	m
Slope (m/m):			0.002	m/m
Output:				
Mean Velocity, V, (m/s):			0.8600	m/s
Cross Sectional Area, A, (m^2):			0.1963	m^2
Flow Rate, Q, (m^3/s):			0.1689	m^3/s

File No: 08-XXXX
Project: ACME Developments Subdivision
Date: Sept. 8, 2008

Storm Sewer Calculation Sheet

Consulting Inc.

	Location					Drainage Area				Runoff				Pipe Selection							
		From		To																	
		MH No.	Sta.	MH No.	Sta.	A ha	C	A (Cumul.) ha	Adjusted C	Tc (inlet) min.	Tc (cumul.) min.	I (5yr) * mm/hr	Q m^3/s	Dia. m	So m/m	Pipe Length m	Rough Coeff. n	Velocity (full) m/s	Pipe Capacity m^3/s	Time of Flow min.	Percent Full Flow
	Ninth Drive	101		102		0.13	0.40	0.130	0.40	20	20.00	67.00	0.0097	0.3	0.0119	33.5	0.013	1.49	0.1055	0.37	9%
	Ninth Drive	102		103		1.32	0.55	1.4500	0.54		20.37	66.50	0.1437	0.45	0.0075	92.5	0.013	1.55	0.2469	0.99	58%
	Ninth Drive	103		106		0.14	0.40	1.5900	0.52		21.37	63.00	0.1460	0.45	0.0075	36	0.013	1.55	0.2469	0.39	59%
	Ninth Drive	106		110		1.22	0.40	2.8100	0.47		21.75	62.00	0.2277	0.6	0.003	106.5	0.013	1.19	0.3363	1.49	68%
	Ninth Drive	110		112		1.59	0.40	4.4000	0.45		23.25	60.50	0.3291	0.6	0.0045	76	0.013	1.46	0.4119	0.87	80%
	Ninth Drive	112		115		1.61	0.40	6.0100	0.43		24.12	59.50	0.4301	0.6	0.006	91	0.013	1.68	0.4756	0.90	90%
	Ninth Drive	115		119		1.07	0.40	7.0800	0.43		25.02	58.00	0.4882	0.675	0.005	107	0.013	1.66	0.5944	1.07	82%
	Fifth Road	119		127		2.55	0.40	9.6300	0.42		26.09	57.50	0.6469	0.825	0.0034	88	0.013	1.57	0.8370	0.94	77%
	Second Way	127		142		9.83	0.40	19.4600	0.41		27.03	53.50	1.1862	1.35	0.0010	77	0.013	1.18	1.6878	1.09	70%
	Second Way	142		143		0.9	0.40	20.3600	0.41		28.12	52.00	1.2050	1.35	0.0010	46	0.013	1.18	1.6878	0.65	71%
	Second Way	143		144		0.17	0.40	20.5300	0.41		28.77	51.00	1.1914	1.35	0.0010	31.5	0.013	1.18	1.6878	0.45	71%
	Second Way	144		145		0.73	0.40	21.2600	0.41		29.21	50.50	1.2207	1.35	0.0010	47	0.013	1.18	1.6878	0.66	72%
	Second Way	145		169		0.38	0.40	21.6400	0.41		29.88	50.00	1.2297	1.35	0.0011	96	0.013	1.24	1.7702	1.29	69%
	Block 294	169		170		14.5	0.40	36.1400	0.41		31.17	48.00	1.9539	1.65	0.0008	42	0.013	1.21	2.5780	0.58	76%
	Easement	170		pond		8.734	0.74	44.8740	0.47		31.75	46.50	2.7276	1.65	0.0015	37.5	0.013	1.65	3.5300	0.38	77%
											32.13										
*																					
	Easement	pond		171	note 1								0.9540	1800x90	0.0010	36.5	0.013	1.09	1.7660	0.56	54%
	Easement	171		culver	note 1								0.9540	2100x90	0.0010	19	0.013	1.13	2.1284	0.28	45%
															0.0034	1063					
*																					
	Tenth Crescent	105		106		0.57	0.40	0.5700	0.40	20	20.00	67.00	0.0424	0.3	0.0071	70	0.013	1.15	0.0815	1.01	52%
											21.01										
*																					
	Tenth Crescent	105		104		0.07	0.40	0.0700	0.40	20	20.00	67.00	0.0052	0.3	0.01	10	0.013	1.37	0.0967	0.12	5%
	Tenth Crescent	104		107		0.56	0.40	0.6300	0.40		20.12	66.00	0.0462	0.3	0.0095	45.5	0.013	1.33	0.0943	0.57	49%
	Tenth Crescent	107		108		0.23	0.40	0.8600	0.40		20.69	65.00	0.0621	0.375	0.003	55	0.013	0.87	0.0960	1.05	65%
	Eleventh Crescent	109		110		0.37	0.40	1.2300	0.40		21.74	63.00	0.0861	0.375	0.003	70	0.013	0.87	0.0960	1.34	90%
											21.74										
*																					
	Eleventh Crescent	108		109		0.11	0.40	0.1100	0.40	20	20.00	67.00	0.0082	0.3	0.01	14	0.013	1.37	0.0967	0.17	8%
											20.17										
*																					
	Twelfth Court	111		112		1.27	0.40	1.2700	0.40	20	20.00	67.00	0.0945	0.45	0.003	51.5	0.013	0.98	0.1562	0.87	61%
											20.87										
*																					
	Thirteenth Crescent	113		116		0.66	0.40	0.6600	0.40	20	20.00	67.00	0.0491	0.3	0.0042	100	0.013	0.89	0.0627	1.88	78%
	Thirteenth Crescent	116		117		0.08	0.40	0.7400	0.40		21.88	64.00	0.0526	0.3	0.004	10	0.013	0.87	0.0612	0.19	86%
	Thirteenth Crescent	117		118		0.11	0.40	0.8500	0.40		22.07	63.75	0.0602	0.375	0.004	27	0.013	1.00	0.1109	0.45	54%
	Thirteenth Crescent	118		119		0.25	0.40	1.1000	0.40		22.52	62.50	0.0764	0.375	0.004	64	0.013	1.00	0.1109	1.06	69%
*											23.58										
	Thirteenth Crescent	113		114		0.04	0.40	0.0400	0.40	20	20.00	67.00	0.0030	0.3	0.006	8	0.013	1.06	0.0749	0.13	4%
	Thirteenth Crescent	114		115		0.27	0.40	0.3100	0.40		20.13	66.50	0.0229	0.3	0.004	69	0.013	0.87	0.0612	1.33	37%
*											21.45										
	Ninth Drive	120		119		1.22	0.40	1.2200	0.40	20	20.00	67.00	0.0908	0.675	0.002	119	0.013	1.05	0.3759	1.89	24%

File No: 08-XXXX
Project: ACME Developments Subdivision
Date: Sept. 8, 2008

Storm Sewer Calculation Sheet

Consulting Inc.

	Location					Drainage Area				Runoff				Pipe Selection							
		From		To																	
		MH No.	Sta.	MH No.	Sta.	A ha	C	A (Cumul.) ha	Adjusted C	Tc (inlet) min.	Tc (cumul.) min.	I (5yr) * mm/hr	Q m^3/s	Dia. m	So m/m	Pipe Length m	Rough Coeff. n	Velocity (full) m/s	Pipe Capacity m^3/s	Time of Flow min.	Percent Full Flow
*											21.89										
	Seventh Crescent	121		122		0.05	0.40	0.0500	0.40	20	20.00	67.00	0.0037	0.3	0.015	10	0.013	1.68	0.1184	0.10	3%
	Seventh Crescent	122		123		0.45	0.40	0.5000	0.40		20.10	66.50	0.0369	0.3	0.012	92	0.013	1.50	0.1059	1.02	35%
	Seventh Crescent	123		124		0.15	0.40	0.6500	0.40		21.12	64.00	0.0462	0.3	0.01	30	0.013	1.37	0.0967	0.37	48%
	Seventh Crescent	124		125		0.97	0.40	1.6200	0.40		21.49	63.00	0.1134	0.375	0.0058	120	0.013	1.21	0.1335	1.65	85%
	Second Way	125		126		0.97	0.40	2.5900	0.40		23.14	60.50	0.1741	0.45	0.01	109.5	0.013	1.79	0.2851	1.02	61%
	Second Way	126		127		0.65	0.40	3.2400	0.40		24.16	60.00	0.2160	0.45	0.016	88.5	0.013	2.27	0.3606	0.65	60%
											24.81										
*																					
	Seventh Crescent	121		128		0.29	0.40	0.2900	0.40	20	20.00	67.00	0.0216	0.3	0.004	81.5	0.013	0.87	0.0612	1.57	35%
	Seventh Crescent	128		129		0.06	0.40	0.3500	0.40		21.57	64.00	0.0249	0.3	0.004	11.5	0.013	0.87	0.0612	0.22	41%
	Seventh Crescent	129		130		0.61	0.40	0.9600	0.40		21.79	63.50	0.0677	0.375	0.0095	91	0.013	1.55	0.1709	0.98	40%
	Seventh Crescent	130		131		0.48	0.40	1.4400	0.40		22.77	61.00	0.0976	0.375	0.0267	27	0.013	2.59	0.2865	0.17	34%
	Seventh Crescent	131		134		0.98	0.40	2.4200	0.40		22.95	60.50	0.1627	0.45	0.008	87.5	0.013	1.60	0.2550	0.91	64%
	Eighth Street	134		138		1.22	0.40	3.6400	0.40		23.85	60.00	0.2427	0.6	0.004	87.5	0.013	1.37	0.3883	1.06	62%
	Eighth Street	138		139a	note 2	1.28	0.40	4.9200	0.40		24.92	59.00	0.3225	0.75	0.0015	82	0.013	0.98	0.4312	1.40	75%
	Fifth Road	139		140		1.09	0.40	6.0100	0.40		26.32	58.00	0.3873	0.75	0.002	53	0.013	1.13	0.4979	0.78	78%
	Fifth Road	140		127		0.11	0.40	6.1200	0.40		27.10	57.50	0.3910	0.75	0.002	33	0.013	1.13	0.4979	0.49	79%
											27.59										
*																					
	Fourth Street	135		136		0.49	0.40	0.4900	0.40	20	20.00	67.00	0.0365	0.3	0.004	54.5	0.013	0.87	0.0612	1.05	60%
	Fourth Street	137		138		0.34	0.40	0.8300	0.40		21.05	65.00	0.0599	0.375	0.004	47	0.013	1.00	0.1109	0.78	54%
											21.83										
*																					
	Fourth Street	136		135		0.5	0.40	0.5000	0.40	20	20.00	67.00	0.0372	0.3	0.006	60.5	0.013	1.06	0.0749	0.95	50%
	Fourth Street	135		159		0.3	0.40	0.8000	0.40		20.95	67.00	0.0596	0.45	0.004	78	0.013	1.13	0.1803	1.15	33%
											22.10										
*																					
	Fifth Road	161		160		0.58	0.40	0.5800	0.40	20	20.00	67.00	0.0432	0.3	0.004	75.5	0.013	0.87	0.0612	1.45	71%
	Fifth Road	160		139		0.32	0.40	0.9000	0.40		21.45	64.00	0.0640	0.375	0.0047	37.5	0.013	1.09	0.1202	0.57	53%
											22.03										
*																					
	First Crescent	146		147		0.65	0.40	0.6500	0.40	20	20.00	67.00	0.0484	0.3	0.0097	103	0.013	1.35	0.0952	1.27	51%
	First Crescent	147		148		0.63	0.40	1.2800	0.40		21.27	64.00	0.0910	0.375	0.0082	101	0.013	1.44	0.1588	1.17	57%
	First Crescent	148		149		0.23	0.40	1.5100	0.40		22.45	62.00	0.1040	0.375	0.0092	11	0.013	1.52	0.1682	0.12	62%
	First Crescent	149		151		0.39	0.40	1.9000	0.40		22.57	61.50	0.1298	0.375	0.0081	71.5	0.013	1.43	0.1578	0.83	82%
	Third Drive	151		152		1.58	0.40	3.4800	0.40		23.40	60.00	0.2320	0.6	0.003	110	0.013	1.19	0.3363	1.54	69%
	Third Drive	152		153		0.69	0.40	4.1700	0.40		24.94	59.00	0.2734	0.6	0.003	74	0.013	1.19	0.3363	1.04	81%
	Third Drive	153		157		0.06	0.40	4.2300	0.40		25.98	58.00	0.2726	0.6	0.003	25	0.013	1.19	0.3363	0.35	81%
	Second Way	157		158		4.63	0.47	8.8600	0.44		26.33	56.50	0.6071	0.825	0.003	41	0.013	1.47	0.7862	0.46	77%
	Second Way	158		159		0.66	0.40	9.5200	0.43		26.79	55.00	0.6313	0.825	0.0033	56.5	0.013	1.54	0.8246	0.61	77%
	Second Way	159		162a	note 2	1.28	0.40	10.8000	0.43		27.40	53.00	0.6837	0.975	0.0015	75	0.013	1.16	0.8680	1.08	79%
	Second Way	162		167		1.2	0.40	12.0000	0.43		28.48	52.00	0.7401	1.05	0.001	88	0.013	1.00	0.8635	1.47	86%
	Second Way	167		168		1.91	0.40	13.9100	0.42		29.95	50.50	0.8260	1.2	0.001	65	0.013	1.09	1.2329	0.99	67%
	Second Way	168		169		0.59	0.40	14.5000	0.42		30.94	50.00	0.8506	1.2	0.001	76.5	0.013	1.09	1.2329	1.17	69%
*											32.11										
	Third Drive	132		156		3.27	0.50	3.2700	0.50	20	20.00	67.00	0.3043	0.6	0.0055	60	0.013	1.61	0.4554	0.62	67%

File No: 08-XXXX
Project: ACME Developments Subdivision
Date: Sept. 8, 2008

Storm Sewer Calculation Sheet

Consulting Inc.

	Location					Drainage Area				Runoff				Pipe Selection							
		From		To																	
		MH No.	Sta.	MH No.	Sta.	A ha	C	A (Cumul.) ha	Adjusted C	Tc (inlet) min.	Tc (cumul.) min.	I (5yr) * mm/hr	Q m^3/s	Dia. m	So m/m	Pipe Length m	Rough Coeff. n	Velocity (full) m/s	Pipe Capacity m^3/s	Time of Flow min.	Percent Full Flow
	Third Drive	156		157		0.39	0.40	3.6600	0.49		20.62	66.50	0.3308	0.675	0.003	79.5	0.013	1.29	0.4604	1.03	72%
*											21.65										
	Third Drive	132		133		0.23	0.40	0.2300	0.40	20	20.00	67.00	0.0171	0.3	0.005	67.5	0.013	0.97	0.0684	1.16	25%
	Third Drive	133		134		0.21	0.40	0.4400	0.40		21.16	65.00	0.0318	0.3	0.004	68	0.013	0.87	0.0612	1.31	52%
*											21.16										
	Third Drive	150		151		0.2	0.40	0.2000	0.40	20	20.00	67.00	0.0149	0.3	0.004	32	0.013	0.87	0.0612	0.62	24%
*																					
	First Crescent	146		154		0.17	0.40	0.1700	0.40	20	20.00	67.00	0.0127	0.3	0.04	11	0.013	2.74	0.1934	0.07	7%
	First Crescent	154		155		0.48	0.40	0.6500	0.40		20.07	66.50	0.0480	0.3	0.0326	70.5	0.013	2.47	0.1746	0.48	28%
	First Crescent	155		157		0.15	0.40	0.8000	0.40		20.54	66.00	0.0587	0.3	0.0071	41	0.013	1.15	0.0815	0.59	72%
											21.14										
*																					
	Business area	stub		170		8.094	0.80	8.0940	0.80	20	20.00	67.00	1.2051	0.975	0.005	35	0.013	2.12	1.5847	0.27	76%
*											20.27										
	Sixth Street	163		164		0.15	0.40	0.1500	0.40	20	20.00	67.00	0.0112	0.3	0.004	34.5	0.013	0.87	0.0612	0.66	18%
	Sixth Street	164		165		0.43	0.40	0.5800	0.40		20.66	65.00	0.0419	0.3	0.004	40	0.013	0.87	0.0612	0.77	68%
	Sixth Street	165		166		0.33	0.40	0.9100	0.40		21.44	63.00	0.0637	0.375	0.004	47.5	0.013	1.00	0.1109	0.79	57%
	Sixth Street	166		167		0.09	0.40	1.0000	0.40		22.22	61.00	0.0678	0.45	0.004	25	0.013	1.13	0.1803	0.37	38%
											22.59										
*																					
	Sixth Street	161		142		0.59	0.40	0.5900	0.40	20	20.00	65.00	0.0426	0.3	0.004	75.5	0.013	0.87	0.0612	1.45	70%
											21.45										
*																					
	Sixth Street	163		141		0.46	0.40	0.4600	0.40	20	20.00	67.00	0.0342	0.3	0.004	51	0.013	0.87	0.0612	0.98	56%
	Sixth Street	141		142		0.08	0.40	0.5400	0.40		20.98	65.00	0.0390	0.3	0.004	25.5	0.013	0.87	0.0612	0.49	64%
											21.47										
*																					

Run-off coefficients

Single family	**0.40**
Commercial	**0.80**
Institutional	**0.50**
Industrial	**0.80**

Q = 2.78 C I A

*** I is based on City of Ottawa IDF Curves (Ottawa International Airport)**

LEGEND:

- PROPOSED SANITARY MANHOLE
- PROPOSED CATCH-BASIN
- PROPOSED STORM MANHOLE
- EXISTING SANITARY SEWER AND MH
- EXISTING WATERMAIN AND HYDRANT
- PROPOSED WATER VALVE
- PROPOSED SANITARY SEWER
- PROPOSED WATERMAIN
- PROPOSED STORM SEWER
- PROPOSED STREET LIGHT (TYPICAL AS PER GOULBOURN STANDARD R-25 TYPE A)
- COMMUNITY MAIL BOX LOCATION
- HYDRANT AND VALVE
- PROPOSED BUILDING SERVICE LATERAL (SEE DETAIL DRAWING No. 08-0108-DS1)
  1-20mmØ WATER
  1-100mmØ STORM
  1-125mmØ SANITARY
- 13 LOT NUMBER
- PROPOSED EASEMENT
- A=0.45 AREA IN HECTARES
- C=0.40 RUNOFF COEFFICIENT UNLESS OTHERWISE NOTED
- FLOW DIRECTION
- AREA BOUNDARY

30 0 30 60
SCALE: 1:1500 METRES

NOTE: 1: 1,500 SCALE ON ORIGINAL 'D' SIZE DRAWING

FOR MOE APPROVAL ONLY

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

APPROVED	APPROVED	APPROVED
PLACE STAMP OF LICENCED PROFESSIONAL ENGINEER HERE		

PROJECT

ACME DEVELOPMENT INC.
ACME ANYTOWN SUBDIVISION
THE CITY OF ANYTOWN

TITLE

STORM DRAINAGE AREA PLAN

PROJECT No.	Your Project No.		FILE No. 0811220108-ST1.dwg
DESIGN	J.C.	27 Aug. 2008	SCALE AS SHOWN REV.
CAD	J.D.	28 Aug. 2008	FIGURE
CHECK	J.C.	29 Aug. 2008	08-0108-ST1
REVIEW	P.M.	30 Aug. 2008	

APPENDIX D

Stormwater Management Calculations

Appendix D - Sample Stormwater Management Calculations

1.0 Time of Concentration

1.1 Pre-Development Conditions

Times of concentration for existing conditions were determined using the SCS Upland Method. This method applies to overland and ditch flows for drainage areas up to 10 square kilometers (ref. RTAC Drainage Manual, 1989) A copy of Figure 2.4.2 from this manual is attached for reference.

Times of concentration were determined for several possible drainage routes under existing conditions in order to find the longest time (i.e. time when entire area will contribute runoff)

The longest flow path was as follows:

1. 165m overland flow at 2.4%, V=0.12 m/s (Figure 2.4.2, hay meadow)
   flow time = 23 min
2. 400m ditch flow at 0.18%, V=0.19 m/s (Figure 2.4.2, grassed waterway)
   flow time = 35 min.
3. 350m ditch flow at 0.44%, V=0.3 m/s (Figure 2.4.2, grassed waterway)
   flow time = 19 min.
4. 390m ditch flow at 0.5%, V=0.34 m/s (Figure 2.4.2, grassed waterway)
   flow time = 19 min.

Time of Concentration = Total Flow Time = 96 min.

Time to peak (used for Otthymo modelling) = 0.67*Tc = 64 min. = 1.07 hr.

1.2 Post-Development Conditions

Times of concentration for post-development conditions are not required since Otthymo calculates the hydrograph time to peak for developed land based on slopes and impervious levels.

2.0 Pond Volume Calculations

The volume of the stormwater management facility was estimated using the formula for the volume of the frustrim of a pyramid as follows:

$$V = h/3 * (A_1 + A_2 + (A_1 * A_2)^{0.5})$$

where:

- h = height of pyramid (m)
- A_1 = area of base (m^2)
- A_2 = area of top (m^2)

2.1 Permanent Pool Volume

The volume of the permanent pool was determined by calculating the volume of the pond without low flow berms, and then subtracting the estimated volume lost to berms.

2.1.1 Permanent Pool Volume (without low flow berms)

normal water elevation:	102.56	m
base of pond elevation:	100.5	m
depth of pond:	2.06	m
pond base length:	120	m
pond base width:	54	m
pond base area:	6480	sq.m
permanent pool top length:	140	m
permanent pool top width:	74	m
permanent pool top area:	10360	sq.m

Permanent Pool Volume (using frustrum of pyramid formula):

$$V = 2.06/3 * (6480+10360+(6480*10360)^{.5}$$
$$= 17189.6 \text{ cu.m}$$

2.1.2 Peninsula (at normal water level)

base length:	40	m
base width:	35	m
base area:	1400	sq.m
top length:	20	m
top width:	35	m
top area:	700	sq.m

Peninsula Volume (using frustrum of pyramid formula):

V = 2121.8 cu.m

2.1.3 Sediment Forebay Berm

total berm length:	60	m
typical section:		
base width:	23	m
top width:	3	m
average height:	2	m
average area:	26	sq.m

Berm Volume (length x area):

V = 1560 cu.m

2.1.4 Overal Permanent Pool Volume

V = 13507.9 cu.m (1.1.1-(1.1.2+1.1.3))

This method was also used to calculate extended detention storage volumes for the water quality and quantity storm events, and to develop a Storage-Discharge relationship for modelling purposes. Both the volumes were checked with volumes required as per SWMPD Manual, Table 3.2.

3.0 Falling Head Orifice Equation

$$t = \frac{2*A_p}{CA_0(2g)^{0.5}} (h_1^{0.5} - h_2^{0.5})$$

where:

- t= drawdown time (seconds)
- A_p= pond surface area (sq.m), approximately 9600 sq.m at normal water level
- C= discharge coefficient
- A_0= area of orifice (sq.m)
- h_1= starting water elevation above orifice (m), approximately 0.2m
- h_2= ending water elevation above orifice (m), 0m for normal water level

The target drawdown time is 24 hours (86400 seconds) according to MOE guidelines.

An orifice coefficient of 0.595 was selected for this calculation from table 4.1 presented in Handbook of Hydraulics, 7th Edition, 1996, by Brater and King. This coefficient is applicable to .15m diameter circular orifices under 0.2m head.

From the above equation, a 0.22m diameter orifice is selected. This will provide a drawdown time of:

= 85706 seconds
= 23.8 hours

4.0 Sample Discharge Calculation

4.1 Broad Crested Weir

$$Q = CLH^{3/2}$$

where:

- Q= discharge (m^3/s)
- C= weir coefficient
- L= length of weir (m)
- H= head above weir (m)

4.1.1 Sample Discharge Calculation

Pond elevation =	103.76	m (approximate 100-year elevation)
Weir elevation=	102.76	m
Normal water elevation =	102.56	m
Depth of pond (above normal water) =	1.2	m
Head above weir =	1	m

Select C=1.83 for broad crested weir with breadth of approximately 0.2m and head of 0.6m or higher
(ref.Table 5.1, Handbook of Hydraulics, Brater and King, 1996.)

$Q = 1.83*1.0*(1.0)^{\wedge 3/2}$
$= 1.83\ m^3/s$

4.1.2 Correction for Submerged Conditions

During high discharge flow rates, the weir will operate under submerged conditions.
The flow rate calculated above can be corrected for flow under submerged conditions with reference to Figure 5.5 of the Handbook of Hydraulics, Brater and King, 1986. Although this table is for submerged sharp-crested weirs, it is assumed to also apply to broad-crested weirs.

For Q = 1.83 m^3/s, the depth of water downstream of the weir is determined as follows:

Using the manning equation with n=0.013, slope of channel = 0.001 m/m and a channel width of 1.8m (1800mm x 900mm box culvert), the depth of flow is approximately 0.76m (elev. 103.32).
This is 0.56m above the top of the weir.

From Figure 5.5, with H_2/H_1 = (103.32 - 102.76) / (103.76 - 102.76) = 0.56, then Q/Q_1 = 0.82
Thterfore, the corrected weir flow is 0.82 * 1.83 = 1.50 m^3/s

But this flow rate will result in a lower depth of water downstream of the weir.
A new depth of flow downstream of the weir is determined for 1.5 m^3/s and the above process is repeated until the corrected flow rate and the depth of flow downstream of the weir are equal.

By trial and error, it is determined that the corrected flow rate for this scenario is approximately 1.59 m^3/s

4.2 Orifice

$$Q = CA(2gh)^{\wedge .5}$$

where:

- Q= discharge (m^3/s)
- C= orifice coefficient
- A= area of orifice (m^2)
- H= head above centre of orifice (m)

$$A = \frac{3.14*D^{\wedge 2}}{4}$$
$$= 0.038\ m^2 \text{ (for D=0.22m)}$$

Pond Elevation = 103.76 m
Estimated water elevation d/s of orifice = 103.26 m (0.7m depth in outlet 1800mm x 900mm box culvert)
H = 0.5 m

C = 0.598 (0.15m orifice with 1m head, ref.Table 4.1, Handbook of Hydraulics, Brater and King, 1996)

Q = 0.598*.038*(2*9.81*0.5)^.5
= 0.07 m^3/s

4.3 Total Discharge

Total Discharge = Weir Flow + Orifice Flow

For the above example, with a pond elevation of 103.76m, the total flow is:

= 1.59 m^3/s + .07m^3/s
= 1.66 m^3/s

5.0 Sediment Forebay

5.1 Settling Calculation

$Dist = ((r*Q_p)/Vs)^{0.5}$

where:
Dist. = forebay length (m)
r = length to width ratio
Q_p = peak flowrate from the pond during design quality storm (m^3/s)
V_s = particle settling velocity (m/s)

For this design, select V_s = 0.0003 m/s (ref. SWMPD Manual, Equation 4.5), use 2:1 length to width ratio, and use peak flowrate of 0.038 m^3/s (flowrate from SWM pond at design water quality elevation, i.e. 0.2m depth)

Dist = ((2*.038)/.0003)^.5
= 15.9 m

5.2 Dispersion Length

5.2.1 Peak Inlet Rate from Water Quality Storm

The peak inlet flowrate is determined using the rational formula and the rainfall intensity for a 25mm storm.

i = 43C + 5.9 (intensity for 25mm storm, equation 3.7 from the SWMPPD manual)
with C = 0.6, i = 31.7 mm/hr

Rational Formula:

Q = CiA/360

where:
Q = peak flowrate (m3/s)
C = runoff coefficient (0.6 for overall area contributing to forebay)
i = 31.7 mm/hr
A = 50.53 ha (total area contributing to forebay)

Q = 2.7 m^3/s

5.2.2 Dispersion Length Calculation

$$Dist = 8Q / dV_f$$

where:

Dist = length of dispersion (m)
Q = peak inlet flowrate from water quality storm (m^3/s)
d = depth of the permanent pool in the forebay (m)
V_f = desired velocity in the forebay (m/s)

For this design:

Q =	2.7	m^3/s
d =	2	m
V_f =	0.5	m/s (SWMPD manual)

Dist = 21.6 m

5.3 Minimum Forebay Bottom Width

Width =	Dist / 8	m
=	21.6 / 8	m
=	2.7	m

5.4 Check Velocity

Check velocity using entire width of forebay to confirm that average velocity is < 0.15 m/s

Using the peak inlet flowrate of 2.7 m^3/s, and a maximum average velocity of 0.15 m/s, the forebay width should be 18m.

5.5 Overall Length and Width

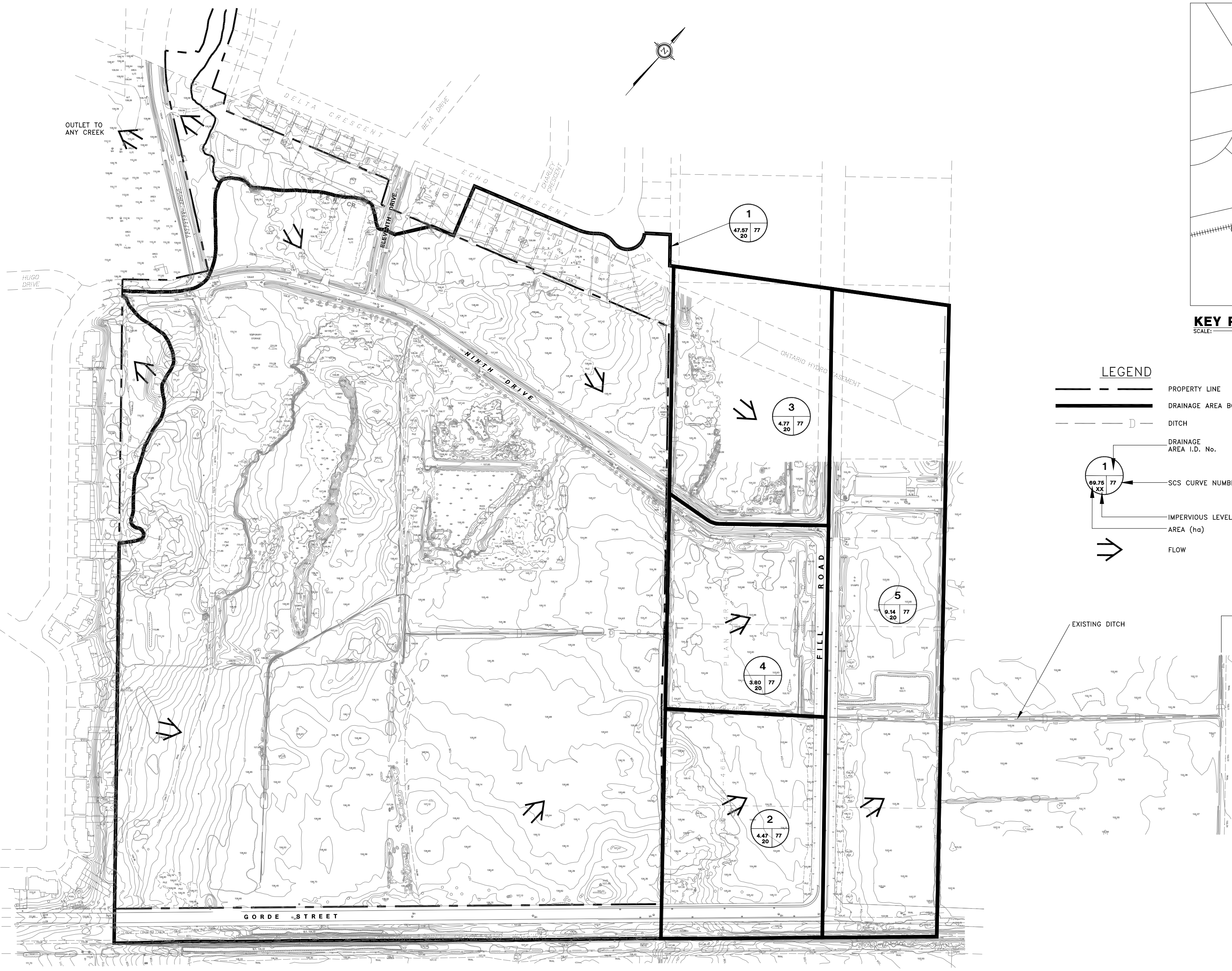
Based on the above calculations, the critical dimension is the 18m width determined in section 5.4. Therefore, in order to maintain a 2:1 length to width ratio, the forebay is designed to be a minimum 36m long and 18m wide.

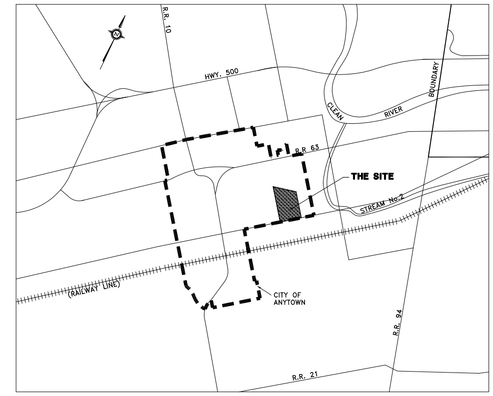
5.6 Summary of Stormwater Flow Estimates

Scenario	Sub-Drainage Area	Description	Area	25 mm Peak Flow (m^3/s)	2-year Peak Flow (m^3/s)	5-year Peak Flow (m^3/s)	100-year Peak Flow (m^3/s)
Pre-Development	1	Subdivision	47.57	0.234	0.327	0.753	1.544
	2	South-West Industrial	4.47	0.030	0.041	0.095	0.195
	3	North-West Industrial	4.77	0.027	0.038	0.087	0.178
	4	West Industrial	3.80	0.020	0.028	0.064	0.130
	5	East Indstrial	9.14	0.049	0.069	0.159	0.325
		Overall	**69.75**	**0.360**	**0.503**	**1.158**	**2.372**
Post-Development (Uncontrolled)	1	Granite Ridge	36.65	0.425	0.596	1.370	2.824
	2	Business Employment	8.09	0.314	0.440	1.012	1.695
	3	Abbott Street	1.83	0.055	0.077	0.178	0.299
	4	South-West Industrial	3.27	0.030	0.041	0.095	0.195
	5	South-West Iber Road	0.69	0.021	0.029	0.067	0.112
	6	Fringewood North Subdivision	1.60	0.028	0.040	0.091	0.202
	7	North-West Industrial	3.46	0.027	0.037	0.086	0.176
	8	North-West Iber Road	2.59	0.072	0.101	0.232	0.398
	9	West Industrial	2.53	0.020	0.028	0.064	0.419
	10	East Iber Road (by-passes pond)	2.22	0.062	0.087	0.200	0.343
	11	East Industrial (by-passes pond)	6.60	0.049	0.069	0.159	0.323
		Overall Outlet	**69.75**	**0.968**	**1.355**	**3.116**	**5.794**
Post-Development (Attenuated)	1	Granite Ridge	36.65	0.425	0.596	1.370	2.824
	2	Business Employment	8.09	0.314	0.440	1.012	1.695
	3	Abbott Street	1.83	0.055	0.077	0.178	0.299
	4	South-West Industrial (controlled)	3.27	0.030	0.041	0.095	0.195
	5	South-West Iber Road	0.69	0.021	0.029	0.067	0.112
	6	Fringewood North Subdivision	1.60	0.028	0.040	0.091	0.202
	7	North-West Industrial (controlled)	3.46	0.027	0.037	0.086	0.176
	8	North-West Iber Road	2.59	0.072	0.101	0.232	0.398
	9	West Industrial (controlled)	2.53	0.020	0.028	0.064	0.419
		SWM Pond Inlet	N/A	0.914	1.280	2.943	5.472
		SWM Pond Outlet	N/A	0.305	0.426	0.949	1.729
	10	East Iber Road (by-passes pond)	2.22	0.062	0.087	0.200	0.343
	11	East Industrial (by-passes pond)	6.60	0.049	0.069	0.159	0.323
		Overall Outlet	**69.75**	**0.359**	**0.501**	**1.122**	**2.051**

5.7 Summary of Pond Flow Routing

Depth (m)	Elevation (m)	Total Volume (cu.m)	Total Volume (ha.m)	Discharge (cu.m/s)	Comments
0.00	102.56	0	0.000	0.000	Top of Pernament Pool
0.05	102.61	486	0.049	0.014	
0.10	102.66	979	0.098	0.025	
0.15	102.71	1478	0.148	0.032	
0.20	102.76	1984	0.198	0.038	Invert of Weir (Top of Extended Detention)
0.25	102.81	2535	0.254	0.057	
0.30	102.86	3092	0.309	0.093	
0.35	102.91	3654	0.365	0.142	
0.40	102.96	4222	0.422	0.196	
0.45	103.01	4795	0.479	0.257	
0.50	103.06	5374	0.537	0.324	
0.55	103.11	5958	0.596	0.396	
0.60	103.16	6548	0.655	0.472	
0.65	103.21	7144	0.714	0.551	
0.70	103.26	7746	0.775	0.633	Top of 1:5 Year Event Storage
0.75	103.31	8217	0.822	0.725	
0.80	103.36	8805	0.880	0.820	
0.85	103.41	9399	0.940	0.910	
0.90	103.46	9998	1.000	1.013	
0.95	103.51	10603	1.060	1.119	
1.00	103.56	11214	1.121	1.215	
1.05	103.61	11830	1.183	1.327	
1.10	103.66	12453	1.245	1.441	
1.15	103.71	13081	1.308	1.560	
1.20	103.76	13715	1.372	1.663	
1.25	103.81	14355	1.436	1.785	Top of 1:100 Year Event Storage
1.30	103.86	15001	1.500	1.911	





KEY PLAN

SCALE: N.T.S.

LEGEND

- PROPERTY LINE
- DRAINAGE AREA BOUNDARY
- DITCH
- DRAINAGE AREA I.D. No.
- SCS CURVE NUMBER
- IMPERVIOUS LEVEL (%)
- AREA (ha)
- FLOW

(Legend symbol example: 1 / 69.75 | 77 / XX)

40 0 40 80
SCALE: 1:2000 METRES

NOTE: 1:2,000 SCALE ON ORIGINAL 'D' SIZE DRAWING

FOR MOE APPROVAL ONLY

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

APPROVED — PLACE STAMP OF LICENCED PROFESSIONAL ENGINEER HERE | APPROVED | APPROVED

PROJECT

ACME DEVELOPMENT INC.
ACME ANYTOWN SUBDIVISION
THE CITY OF ANYTOWN

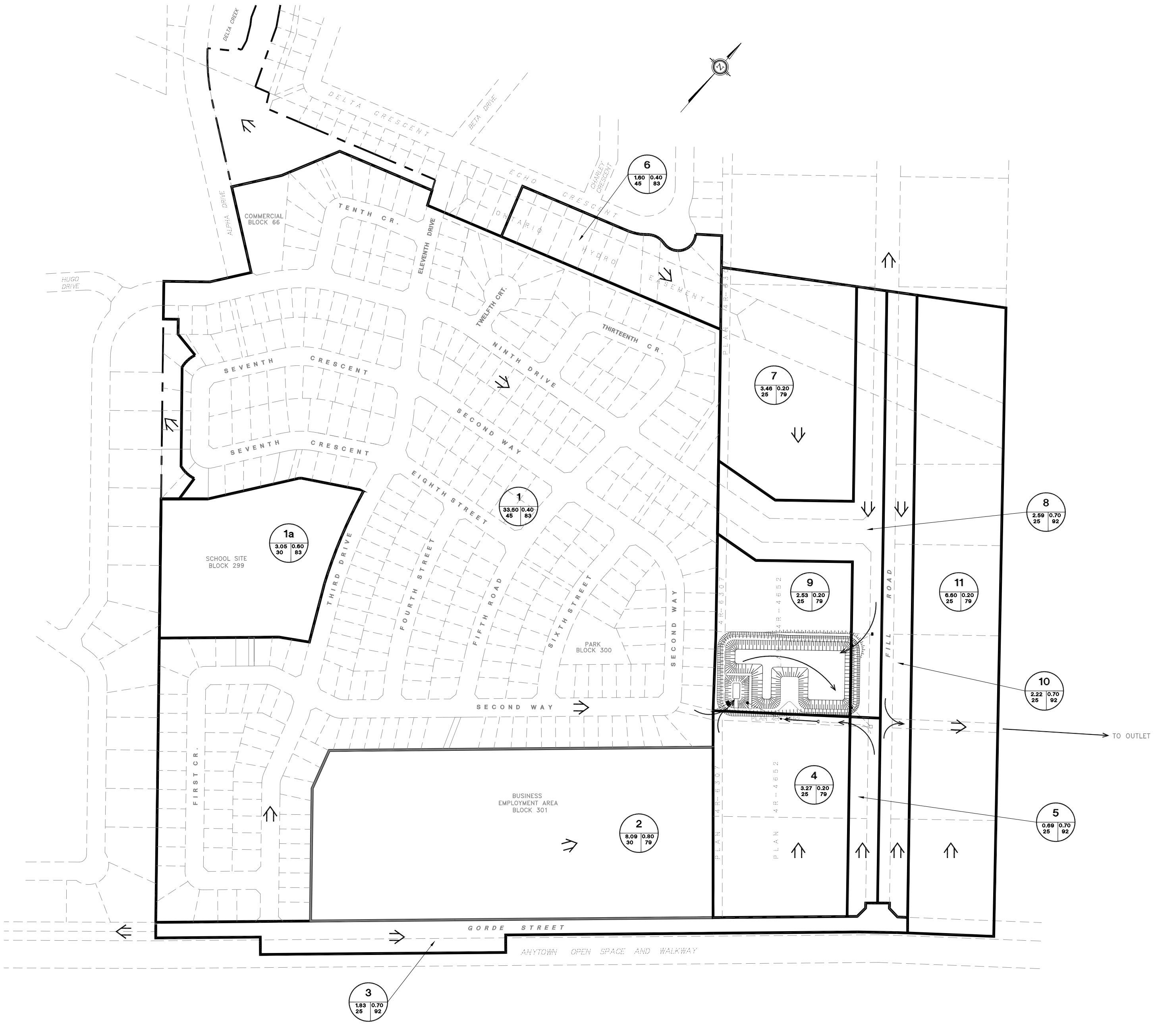
TITLE

PRE-DEVELOPMENT DRAINAGE PLAN

TOPOGRAPHIC MAPPING PROVIDED BY: THE ANY MAPPING CO. INC.

PROJECT No.		Your Project No.	FILE No. 0811220108-SP1.DWG.dwg	
DESIGN	J.C.	27 Aug. 2008	SCALE 1:2,000	REV.
CAD	J.D.	28 Aug. 2008	FIGURE	
CHECK	J.C.	29 Aug. 2008	08-0108-SP1	
REVIEW	P.M.	30 Aug. 2008		

PLOT DATE: February 26, 2009



DELTA CREEK
DELTA CRESCENT
BETA DRIVE
ECHO CRESCENT
CHARLEY CRESCENT
HYDRO EASEMENT
ALPHA DRIVE
HUGO DRIVE
COMMERCIAL BLOCK 66
TENTH CR.
ELEVENTH DRIVE
TWELFTH CRT.
THIRTEENTH CR.
NINTH DRIVE
SEVENTH CRESCENT
SECOND WAY
EIGHTH STREET
SCHOOL SITE BLOCK 299
THIRD DRIVE
FOURTH STREET
FIFTH ROAD
SIXTH STREET
PARK BLOCK 300
FIRST CR.
BUSINESS EMPLOYMENT AREA BLOCK 301
GORDE STREET
ANYTOWN OPEN SPACE AND WALKWAY
FILL ROAD
PLAN 4R-4652
TO OUTLET
1 33.50 0.40 45 83
1a 3.05 0.60 30 83
2 8.09 0.80 30 79
3 1.83 0.70 25 92
4 3.27 0.20 25 79
5 0.69 0.70 25 92
6 1.60 0.40 45 83
7 3.46 0.20 25 79
8 2.59 0.70 25 92
9 2.53 0.20 25 79
10 2.22 0.70 25 92
11 6.60 0.20 25 79

LEGEND

- DRAINAGE AREA BOUNDARY
- XX — SUB-DRAINAGE AREA I.D. No.
- XX.XX — DESIGN RUNOFF COEFFICIENT
- XX — SCS CURVE NUMBER
- XX.XX — AREA (ha)
- XX — IMPERVIOUS LEVEL (%)
- FLOW

40 0 40 80
SCALE: 1:2000 METRES

NOTE: 1:2,000 SCALE ON ORIGINAL 'D' SIZE DRAWING

FOR MOE APPROVAL ONLY

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

APPROVED — PLACE STAMP OF LICENCED PROFESSIONAL ENGINEER HERE

APPROVED

APPROVED

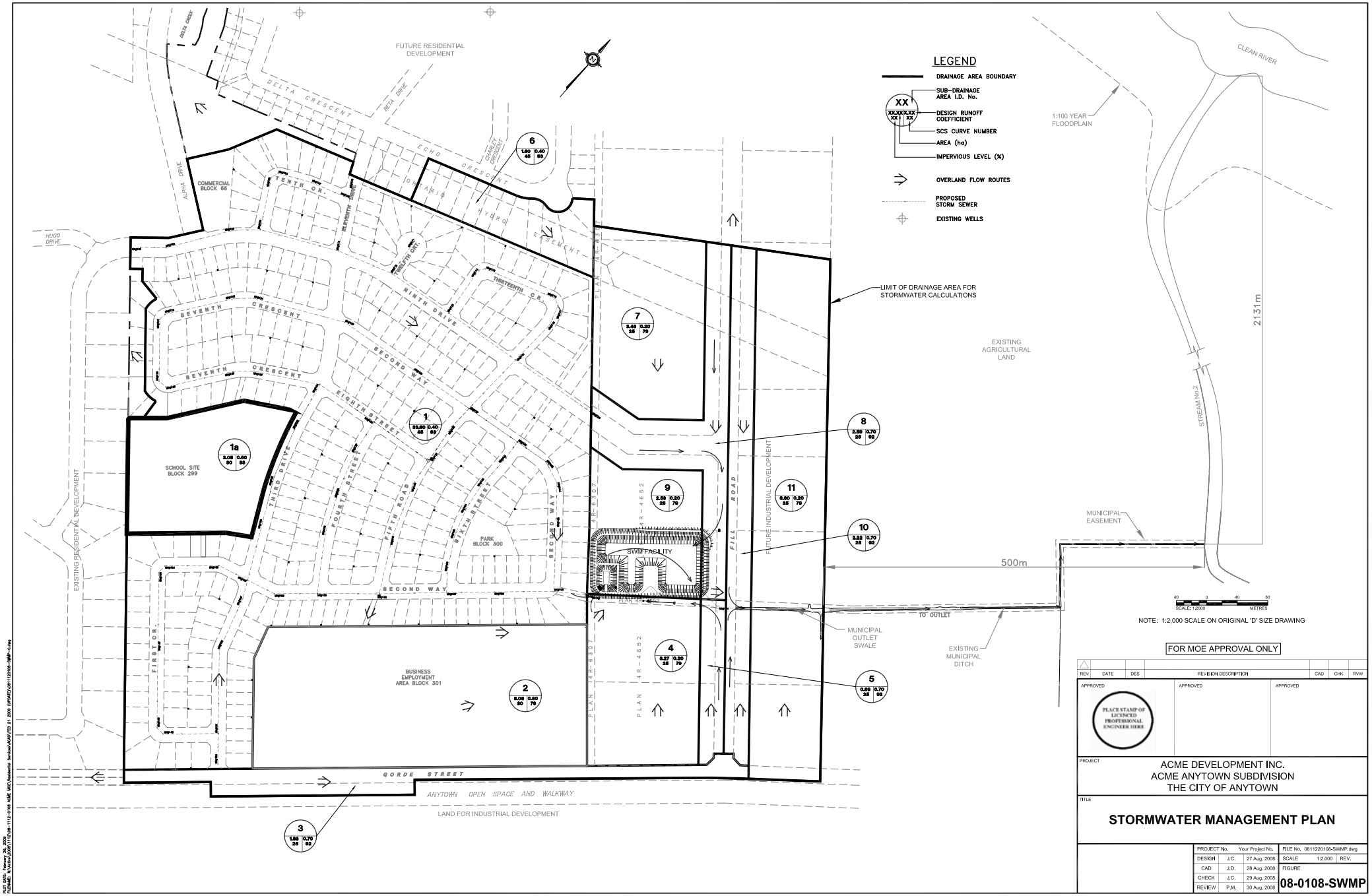
PROJECT
ACME DEVELOPMENT INC.
ACME ANYTOWN SUBDIVISION
THE CITY OF ANYTOWN

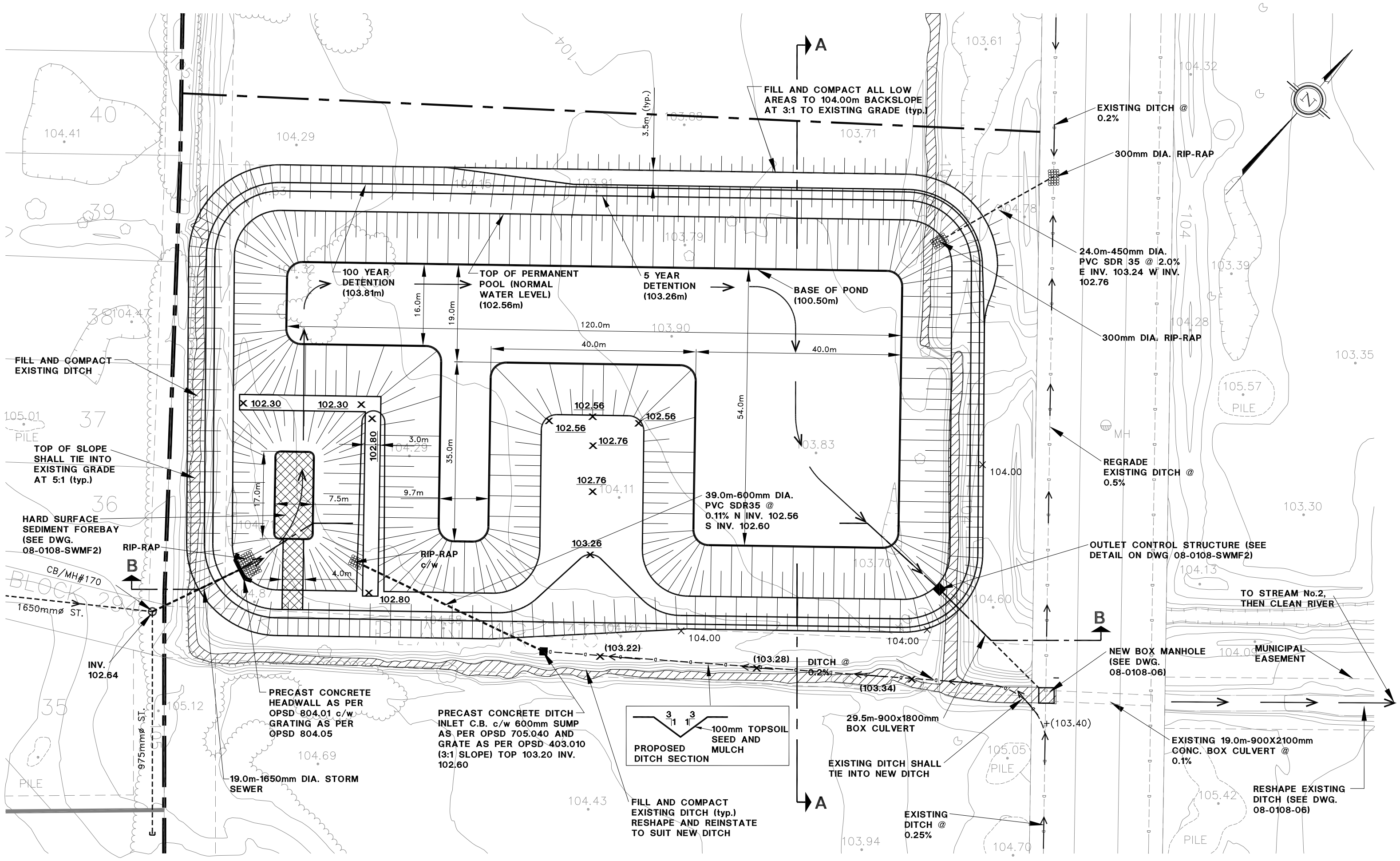
TITLE

POST-DEVELOPMENT DRAINAGE PLAN

PROJECT No.	Your Project No.	
DESIGN	J.C.	27 Aug. 2008
CAD	J.D.	28 Aug. 2008
CHECK	J.C.	29 Aug. 2008
REVIEW	P.M.	30 Aug. 2008

FILE No. 0811220108-SP2.dwg
SCALE 1:2,000 REV.
FIGURE **08-0108-SP2**


LEGEND
DRAINAGE AREA BOUNDARY
SUB-DRAINAGE AREA I.D. No.
DESIGN RUNOFF COEFFICIENT
SCS CURVE NUMBER
AREA (ha)
IMPERVIOUS LEVEL (%)
OVERLAND FLOW ROUTES
PROPOSED STORM SEWER
EXISTING WELLS
FUTURE RESIDENTIAL DEVELOPMENT
DELTA CRESCENT
BETA DRIVE
ECHO CRESCENT
ALPHA DRIVE
COMMERCIAL BLOCK 66
TENTH CR.
ELEVENTH DRIVE
TWELFTH CRES.
THIRTEENTH CR.
NINTH DRIVE
SEVENTH CRESCENT
SECOND WAY
EIGHTH STREET
HUGO DRIVE
SCHOOL SITE BLOCK 299
THIRD DRIVE
FOURTH STREET
FIFTH ROAD
SIXTH STREET
PARK BLOCK 300
FIRST CR.
BUSINESS EMPLOYMENT AREA BLOCK 301
QORDE STREET
ANYTOWN OPEN SPACE AND WALKWAY
LAND FOR INDUSTRIAL DEVELOPMENT
EXISTING RESIDENTIAL DEVELOPMENT
HYDRO EASEMENT
PLAN 4R-6397
PLAN 4R-4652
FILL ROAD
FUTURE INDUSTRIAL DEVELOPMENT
SWM FACILITY
LIMIT OF DRAINAGE AREA FOR STORMWATER CALCULATIONS
EXISTING AGRICULTURAL LAND
1:100 YEAR FLOODPLAIN
CLEAN RIVER
STREAM No.2
2131m
MUNICIPAL EASEMENT
500m
TO OUTLET
MUNICIPAL OUTLET SWALE
EXISTING MUNICIPAL DITCH
SCALE 1:2000
METRES
NOTE: 1:2,000 SCALE ON ORIGINAL 'D' SIZE DRAWING
FOR MOE APPROVAL ONLY
REV DATE DES REVISION DESCRIPTION CAD CHK RVW
APPROVED
PLACE STAMP OF LICENCED PROFESSIONAL ENGINEER HERE
APPROVED
APPROVED
PROJECT
ACME DEVELOPMENT INC.
ACME ANYTOWN SUBDIVISION
THE CITY OF ANYTOWN
TITLE
STORMWATER MANAGEMENT PLAN
PROJECT No. Your Project No. FILE No. 0811220106-SWMP.dwg
DESIGN J.C. 27 Aug, 2008 SCALE 1:2,000 REV.
CAD J.D. 28 Aug, 2008 FIGURE
CHECK J.C. 29 Aug, 2008
REVIEW P.M. 30 Aug, 2008
08-0108-SWMP


A
FILL AND COMPACT ALL LOW AREAS TO 104.00m BACKSLOPE AT 3:1 TO EXISTING GRADE (typ.)
EXISTING DITCH @ 0.2%
300mm DIA. RIP-RAP
24.0m-450mm DIA. PVC SDR 35 @ 2.0% E INV. 103.24 W INV. 102.76
300mm DIA. RIP-RAP
100 YEAR DETENTION (103.81m)
TOP OF PERMANENT POOL (NORMAL WATER LEVEL) (102.56m)
5 YEAR DETENTION (103.26m)
BASE OF POND (100.50m)
120.0m
40.0m
40.0m
16.0m
19.0m
35.0m
54.0m
3.5m (typ.)
FILL AND COMPACT EXISTING DITCH
TOP OF SLOPE SHALL TIE INTO EXISTING GRADE AT 5:1 (typ.)
HARD SURFACE SEDIMENT FOREBAY (SEE DWG. 08-0108-SWMF2)
RIP-RAP
RIP-RAP c/w
102.30
102.30
102.80
102.80
3.0m
7.5m
9.7m
17.0m
4.0m
102.56
102.56
102.56
102.76
102.76
103.26
39.0m-600mm DIA. PVC SDR35 @ 0.11% N INV. 102.56 S INV. 102.60
REGRADE EXISTING DITCH @ 0.5%
OUTLET CONTROL STRUCTURE (SEE DETAIL ON DWG 08-0108-SWMF2)
TO STREAM No.2, THEN CLEAN RIVER
B
B
CB/MH#170
BLOCK 29
1650mmø ST.
975mmø ST.
INV. 102.64
PRECAST CONCRETE HEADWALL AS PER OPSD 804.01 c/w GRATING AS PER OPSD 804.05
19.0m-1650mm DIA. STORM SEWER
PRECAST CONCRETE DITCH INLET C.B. c/w 600mm SUMP AS PER OPSD 705.040 AND GRATE AS PER OPSD 403.010 (3:1 SLOPE) TOP 103.20 INV. 102.60
PROPOSED DITCH SECTION
100mm TOPSOIL SEED AND MULCH
FILL AND COMPACT EXISTING DITCH (typ.) RESHAPE AND REINSTATE TO SUIT NEW DITCH
(103.22)
(103.28)
(103.34)
DITCH @ 0.2%
104.00
104.00
104.00
29.5m-900x1800mm BOX CULVERT
EXISTING DITCH SHALL TIE INTO NEW DITCH
NEW BOX MANHOLE (SEE DWG. 08-0108-06)
MUNICIPAL EASEMENT
(103.40)
EXISTING 19.0m-900X2100mm CONC. BOX CULVERT @ 0.1%
RESHAPE EXISTING DITCH (SEE DWG. 08-0108-06)
EXISTING DITCH @ 0.25%
MH
PILE
40
39
38
37
36
35
104.41
104.29
103.61
104.32
103.71
103.39
104.28
103.35
105.57
103.30
104.13
104.60
104.09
105.12
104.69
104.43
103.94
104.70
105.05
105.42
105.01
104.11
103.83
103.70
103.90
103.79

PLAN VIEW

SCALE: 1:400

LEGEND

× (103.87) APPROXIMATE EXISTING DITCH INVERT

⊖MH EXISTING MANHOLE

NOTES:

1. ALL DISTURBED AREAS TO BE REINSTATED TO EQUAL OR BETTER CONDITION.
2. ALL SIDE SLOPES TO BE COMPLETED WITH 100mm TOPSOIL SEED AND MULCH.
3. PLANTING SHALL BE IN ACCORDANCE WITH M.O.E. GUIDELINES. PLANTING WILL INCLUDE SUBMERGENT, FRINGE, AND UPLAND SPECIES.
4. RIP RAP SHALL BE 300mmø (min.) c/w GEOTEXTILE AMOCO NON-WOVEN 4535 OR EQUAL AS PER OPSD 810.01.

8 0 8 16 SCALE: 1:400 METRES

NOTE: 1:400 SCALE ON ORIGINAL 'D' SIZE DRAWING

FOR MOE APPROVAL ONLY

REFER TO SWMF2 FOR FACILITY DETAILS AND SECTIONS.

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

APPROVED — PLACE STAMP OF LICENCED PROFESSIONAL ENGINEER HERE

APPROVED

APPROVED

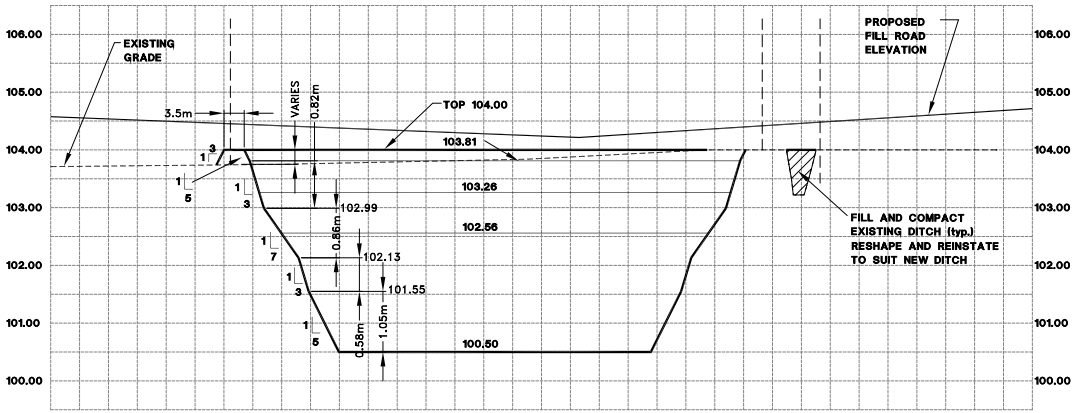
PROJECT

ACME DEVELOPMENT INC.
ACME ANYTOWN SUBDIVISION
THE CITY OF ANYTOWN

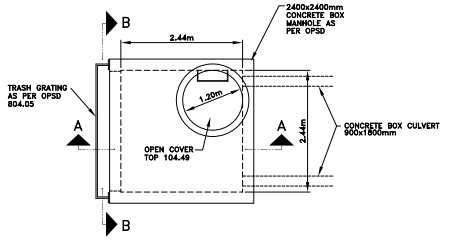
TITLE

STORMWATER MANAGEMENT FACILITY PLAN

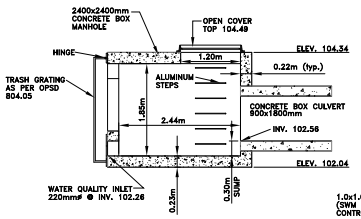
PROJECT No.	Your Project No.	FILE No. 0811220108-SWMF1.dwg
DESIGN J.C.	27 Aug. 2008	SCALE AS SHOWN REV.
CAD J.D.	28 Aug. 2008	FIGURE
CHECK J.C.	29 Aug. 2008	
REVIEW P.M.	30 Aug. 2008	08-0108-SWMF1



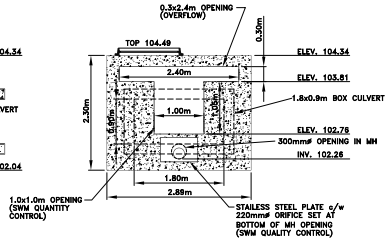
SECTION A-A
SCALE: HOR. 1:400
VERT. 1:40



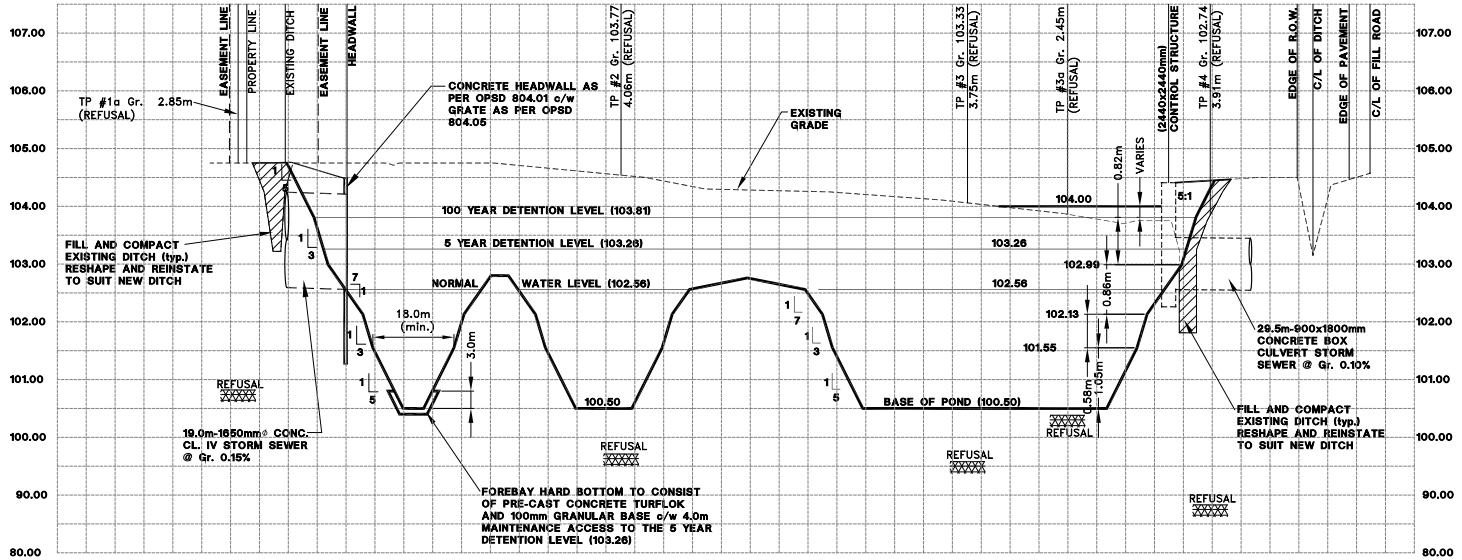
PLAN VIEW
OUTLET CONTROL STRUCTURE DETAIL
(2400x2400mm)



SECTION A-A
OUTLET CONTROL STRUCTURE DETAIL
(2400x2400mm)



VIEW B
OUTLET CONTROL STRUCTURE DETAIL
(2400x2400mm)



SECTION B-B
SCALE: HOR. 1:400
VERT. 1:40

NOTE: 1:400 SCALE ON ORIGINAL 'D' SIZE DRAWING

FOR MOE APPROVAL ONLY

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

APPROVED — PLACE STAMP OF LICENCED PROFESSIONAL ENGINEER HERE | APPROVED | APPROVED

PROJECT
ACME DEVELOPMENT INC.
ACME ANYTOWN SUBDIVISION
THE CITY OF ANYTOWN

TITLE
STORMWATER MANAGEMENT FACILITY DETAILS

PROJECT No.	Your Project No.	FILE No. 0811220108-SWMF2.dwg	
DESIGN	J.C.	27 Aug, 2008	SCALE AS SHOWN REV.
CAD	J.D.	28 Aug, 2008	FIGURE
CHECK	J.C.	29 Aug, 2008	08-0108-SWMF2
REVIEW	P.M.	30 Aug, 2008	

ATTACHMENT 11

DESIGN DRAWINGS

GENERAL NOTES:

1. CONTRACTOR TO VERIFY LOCATION AND ELEVATIONS OF ALL EXISTING SERVICES AND UTILITIES PRIOR TO ANY CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR PROTECTION AND REINSTATEMENT.

2. CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS AND BEAR COST OF SAME.

3. CONSTRUCTION SHALL BE IN ACCORDANCE WITH ANYTOWN AND ONTARIO PROVINCIAL STANDARD DRAWING SUPPLEMENT, WHERE APPLICABLE AND ONTARIO PROVINCIAL STANDARDS SHALL APPLY WHERE NO ANYTOWN STANDARDS ARE AVAILABLE. ALL DRAWINGS TO BE CHECKED FOR CONFIRMATION WITH APPLICABLE BUILDING CODES.

4. THE CONTRACTOR SHALL CONSTRUCT WATERMAIN, WATER SERVICES, CONNECTIONS, AND APPURTENANCES AS PER THE ANYTOWN SPECIFICATIONS AND SHALL COORDINATE AND PAY ALL RELATED COSTS INCLUDING THE COST OF CONNECTION, INSPECTION, DISINFECTION BY ANYTOWN PERSONNEL. SERVICE CONNECTIONS SHALL BE INSTALLED A MINIMUM OF 2400mm FROM ANY CATCHBASIN, MANHOLE, OR OBJECT THAT MAY CONTRIBUTE TO FREEZING. THERMAL INSULATION SHALL BE INSTALLED ON ALL PROPOSED CATCHBASINS ON THE WATERMAIN STREET SIDE WHERE 2400mm SEPARATION CANNOT BE ACHIEVED. (AS PER ANYTOWN WSD-22, WSD-23) (CATHODIC PROTECTION AS PER ANYTOWN STANDARDS WSD-40 AND WSC-11). WATERMAIN TO BE INSTALLED WITH A MINIMUM SEPARATION OF 3.0m FROM SANITARY AND STORM SEWERS. AT LOCATIONS WHERE THE WATERMAIN CROSSES ANY SEWERS, THERE IS TO BE A MINIMUM VERTICAL SEPARATION OF 0.5m AS PER WSD-25.

5. THE CONTRACTOR SHALL CONSTRUCT STORM AND SANITARY SEWERS IN ACCORDANCE WITH OPSD 802.010 802.013 AND 802.014. DURING CONSTRUCTION, PROTECT PIPES FROM HEAVY CONSTRUCTION EQUIPMENT AS PER OPSD 808.01. STORM AND SANITARY SEWER SERVICE CONNECTIONS SHALL BE IN ACCORDANCE WITH ANYTOWN STANDARD S-9. BEDDING AND BACKFILL SHALL BE COMPACTED TO A MIN. OF 95% SPMDD.

6. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES TO PROVIDE FOR PROTECTION OF THE RECEIVING STORM SEWER DURING CONSTRUCTION ACTIVITIES. THESE PRACTICES ARE REQUIRED TO ENSURE NO SEDIMENT AND/OR ASSOCIATED POLLUTANTS ARE RELEASED TO THE RECEIVING WATERCOURSE. (IE FILTER CLOTH ON ALL CATCH BASINS PRIOR TO ASPHALT, STRAW BALE CHECK DAM AT STORM OUTLET, SEDIMENT CONTROLS AROUND DISTURBED AREAS.) DEWATERING SHALL BE PUMPED INTO SEDIMENT TRAPS.

7. ALL DISTURBED AREAS TO BE REINSTATED TO EQUAL OR BETTER CONDITION. PAVEMENT REINSTATEMENT FOR UTILITY CUTS SHALL BE IN ACCORDANCE WITH OPSD 509.010. ALL NEW WORK SHALL TIE INTO EXISTING.

8. STREET LIGHTING TO CONFORM WITH ANYTOWN STANDARD R-26 (TYPICAL). LOCATIONS SHOWN ON PLANS ARE APPROXIMATE.

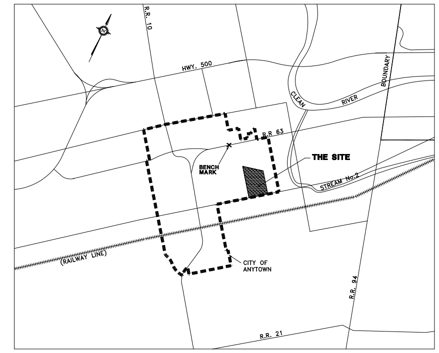
9. REAR YARD CATCH BASIN LEADS ARE TO BE 250mm DIA. PVC SDR35 AT A MIN. GRADE OF 0.50%. STREET CATCH BASIN LEADS TO BE 200mm DIA.

10. WATER SERVICES TO BE INSTALLED WITH 2.5m HORIZONTAL SEPARATION FROM ANY SANITARY AND STORM SERVICES. IN SITUATIONS WHERE WATER SERVICES ARE IN CONFLICT WITH STORM AND SANITARY SEWERS, THE CONTRACTOR SHALL INSTALL WATER SERVICES AS PER ANYTOWN STANDARD WSD-38.

11. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED. ALL DRAWINGS SHOULD NOT BE SCALED BY THE CONTRACTOR. ANY MISSING OR QUESTIONABLE DIMENSIONS ARE TO BE CONFIRMED WITH THE CONSULTANT IN WRITING.

12. ALL MANHOLES SHALL BE 1200mm DIA. CONCRETE AS PER CITY STANDARDS WITH FRAME AND COVER AS PER OPSD 401.01, TYPE A FOR SANITARY, TYPE B FOR STORM UNLESS OTHERWISE NOTED.

13. CONTRACTOR TO CO-ORDINATE WITH ANYTOWN, THE TAPPING OF WATERMAIN SERVICING TO EXISTING 300mmø WATERMAIN ON ELEVENTH DRIVE AND NINTH DRIVE.



KEY PLAN:
SCALE: N.T.S.

BENCH MARK

STATION NAME "88U502" LOCATION ON CONCRETE BOX CULVERT ALONG ANYWHERE ROAD 1.3 km NORTH EAST OF ROAD INTERSECTION WITH PATRICK STREET NORTH. BRASS CAP SET ON TOP OF CULVERT SOUTH SIDE OF ROAD ELEVATION 106.039.

LEGEND:

- PROPOSED SANITARY MANHOLE
- PROPOSED CATCH-BASIN
- PROPOSED STORM MANHOLE
- EXISTING SANITARY SEWER AND MH
- EXISTING WATERMAIN AND HYDRANT
- PROPOSED WATER VALVE
- PROPOSED SANITARY SEWER
- PROPOSED WATERMAIN
- PROPOSED STORM SEWER
- PROPOSED STREET LIGHT (TYPICAL AS PER ANYTOWN STANDARD R-25 TYPE A)
- COMMUNITY MAIL BOX LOCATION
- (2) PROFILES DRAWING NUMBER
- HYDRANT AND VALVE
- PROPOSED BUILDING SERVICE LATERAL (SEE DETAIL DRAWING No. 08-0108-DS1) 1-20mmø WATER 1-100mmø STORM 1-125mmø SANITARY
- 13 LOT NUMBER
- PROPOSED EASEMENT
- PHASING LINE
- PROPOSED FENCE

SCALE: 1:1500 — 30 0 30 60 METRES

NOTE: 1:1,500 SCALE ON ORIGINAL 'D' SIZE DRAWING

FOR MOE APPROVAL ONLY

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

APPROVED | APPROVED | APPROVED

PLACE STAMP OF LICENCED PROFESSIONAL ENGINEER HERE

PROJECT

ACME DEVELOPMENT INC.
ACME ANYTOWN SUBDIVISION
THE CITY OF ANYTOWN

TITLE

OVERALL SITE PLAN

PROJECT No.		Your Project No.	FILE No.	0811220108-OS1.DWG
DESIGN	J.C.	27 Aug. 2008	SCALE	1:1,500 REV.
CAD	J.D.	28 Aug. 2008	FIGURE	
CHECK	J.C.	29 Aug. 2008		08-0108-OS1
REVIEW	P.M.	30 Aug. 2008		

GENERAL NOTES:

1. CONTRACTOR TO VERIFY LOCATION AND ELEVATIONS OF ALL EXISTING SERVICES AND UTILITIES PRIOR TO ANY CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR PROTECTION AND REINSTATEMENT.

2. CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS AND BEAR COST OF SAME.

3. CONSTRUCTION SHALL BE IN ACCORDANCE WITH ANYTOWN AND ONTARIO PROVINCIAL STANDARD DRAWING SUPPLEMENT, WHERE APPLICABLE AND ONTARIO PROVINCIAL STANDARDS SHALL APPLY WHERE NO ANYTOWN OR ANYTOWN STANDARDS ARE AVAILABLE. ALL DRAWINGS TO BE CHECKED FOR CONFIRMATION WITH APPLICABLE BUILDING CODES.

4. THE CONTRACTOR SHALL CONSTRUCT WATERMAIN, WATER SERVICES, CONNECTIONS, AND APPURTENANCES AS PER THE ANYTOWN SPECIFICATIONS AND SHALL COORDINATE AND PAY ALL RELATED COSTS INCLUDING THE COST OF CONNECTION, INSPECTION, DISINFECTION BY ANYTOWN PERSONNEL. SERVICE CONNECTIONS SHALL BE INSTALLED A MINIMUM OF 2400mm FROM ANY CATCHBASIN, MANHOLE, OR OBJECT THAT MAY CONTRIBUTE TO FREEZING. THERMAL INSULATION SHALL BE INSTALLED ON ALL PROPOSED CATCHBASINS ON THE WATERMAIN STREET SIDE WHERE 2400mm SEPARATION CANNOT BE ACHIEVED. (AS PER ANYTOWN WSD-22, WSD-25) (CATHODIC PROTECTION AS PER ANYTOWN STANDARDS WSD-40 AND WSC-11)

5. THE CONTRACTOR SHALL CONSTRUCT STORM AND SANITARY SEWERS IN ACCORDANCE WITH OPSD 802.010 802.013 AND 802.014. DURING CONSTRUCTION, PROTECT PIPES FROM HEAVY CONSTRUCTION EQUIPMENT AS PER OPSD 808.01. STORM AND SANITARY SEWER SERVICE CONNECTIONS SHALL BE IN ACCORDANCE WITH ANYTOWN STANDARD S-9. BEDDING AND BACKFILL SHALL BE COMPACTED TO A MIN. OF 95% SPMDD.

6. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES TO PROVIDE FOR PROTECTION OF THE RECEIVING STORM SEWER DURING CONSTRUCTION ACTIVITIES. THESE PRACTICES ARE REQUIRED TO ENSURE NO SEDIMENT AND/OR ASSOCIATED POLLUTANTS ARE RELEASED TO THE RECEIVING WATERCOURSE. (IE FILTER CLOTH ON ALL CATCH BASINS PRIOR TO ASPHALT, STRAW BALE CHECK DAM AT STORM OUTLET, SEDIMENT CONTROLS AROUND DISTURBED AREAS.) DEWATERING SHALL BE PUMPED INTO SEDIMENT TRAPS.

7. ALL DISTURBED AREAS TO BE REINSTATED TO EQUAL OR BETTER CONDITION. PAVEMENT REINSTATEMENT FOR UTILITY CUTS SHALL BE IN ACCORDANCE WITH OPSD 509.010. ALL NEW WORK SHALL TIE INTO EXISTING. COST OF CONNECTION, INSPECTION, DISINFECTION BY ANYTOWN PERSONNEL.

8. STREET LIGHTING TO CONFORM WITH ANYTOWN STANDARD R-26 (TYPICAL). LOCATIONS SHOWN ON PLANS ARE APPROXIMATE.

9. REAR YARD CATCH BASIN LEADS ARE TO BE 250mm DIA. PVC SDR35 AT A MIN. GRADE OF 0.50%. STREET CATCH BASIN LEADS TO BE 200mm DIA.

10. IN SITUATIONS WHERE WATER SERVICES ARE IN CONFLICT WITH STORM AND SANITARY SEWERS, THE CONTRACTOR SHALL INSTALL WATER SERVICES AS PER ANYTOWN STANDARD WSD-38.

11. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED. ALL DRAWINGS SHOULD NOT BE SCALED BY THE CONTRACTOR. ANY MISSING OR QUESTIONABLE DIMENSIONS ARE TO BE CONFIRMED WITH THE CONSULTANT IN WRITING.

12. ALL MANHOLES SHALL BE 1200mm DIA. CONCRETE AS PER ANYTOWN STANDARDS WITH FRAME AND COVER AS PER OPSD 401.01, TYPE A FOR SANITARY, TYPE B FOR STORM UNLESS OTHERWISE NOTED.

13. CONTRACTOR TO CO-ORDINATE WITH ANYTOWN, THE TAPPING OF WATERMAIN SERVICING TO EXISTING 300ø WATERMAIN ON ELEVENTH DRIVE AND NINTH DRIVE.

LEGEND:

- PROPOSED SANITARY MANHOLE
- PROPOSED CATCH-BASIN
- PROPOSED STORM MANHOLE
- EXISTING SANITARY SEWER AND MH
- EXISTING WATERMAIN AND HYDRANT
- PROPOSED WATER VALVE
- PROPOSED SANITARY SEWER
- PROPOSED WATERMAIN
- PROPOSED STORM SEWER
- PROPOSED STREET LIGHT (TYPICAL AS PER ANYTOWN STANDARD R-25 TYPE A)
- COMMUNITY MAIL BOX LOCATION
- (2) DRAWING NUMBER
- HYDRANT AND VALVE
- PROPOSED BUILDING SERVICE LATERAL (SEE DETAIL DRAWING No. 08-0108-DS1) 1-20mmØ WATER 1-100mmØ STORM 1-125mmØ SANITARY
- 13 LOT NUMBER
- PROPOSED EASEMENT
- PROPOSED FENCE

30 0 30 60
SCALE: 1:1500 METRES

NOTE: 1: 1,500 SCALE ON ORIGINAL 'D' SIZE DRAWING

FOR MOE APPROVAL ONLY

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

APPROVED	APPROVED	APPROVED
PLACE STAMP OF LICENCED PROFESSIONAL ENGINEER HERE		

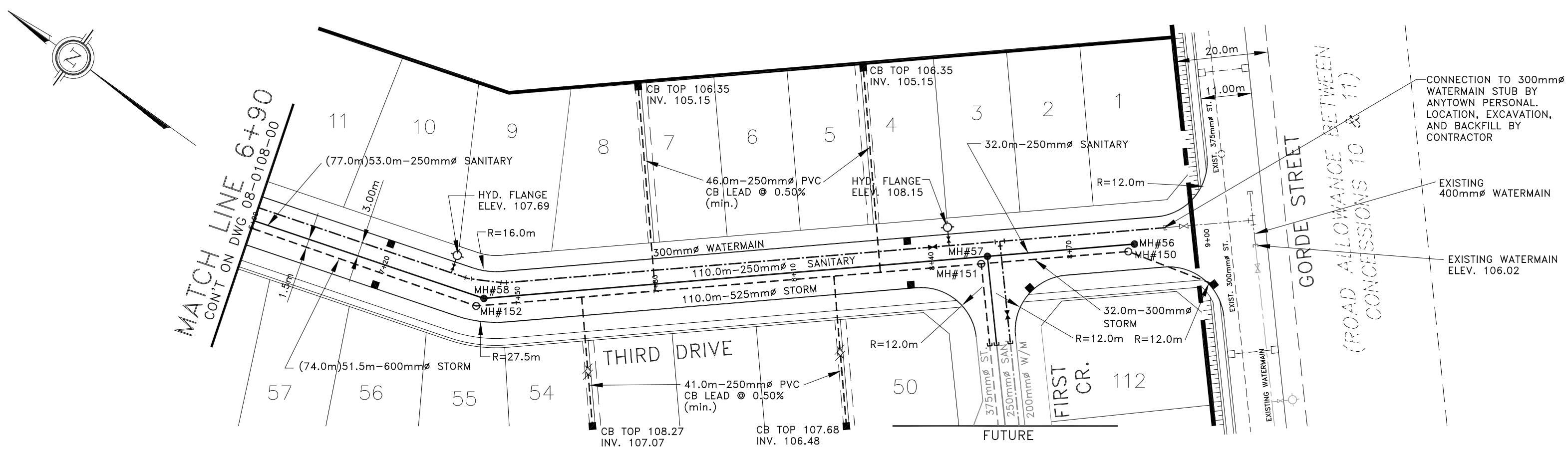
PROJECT

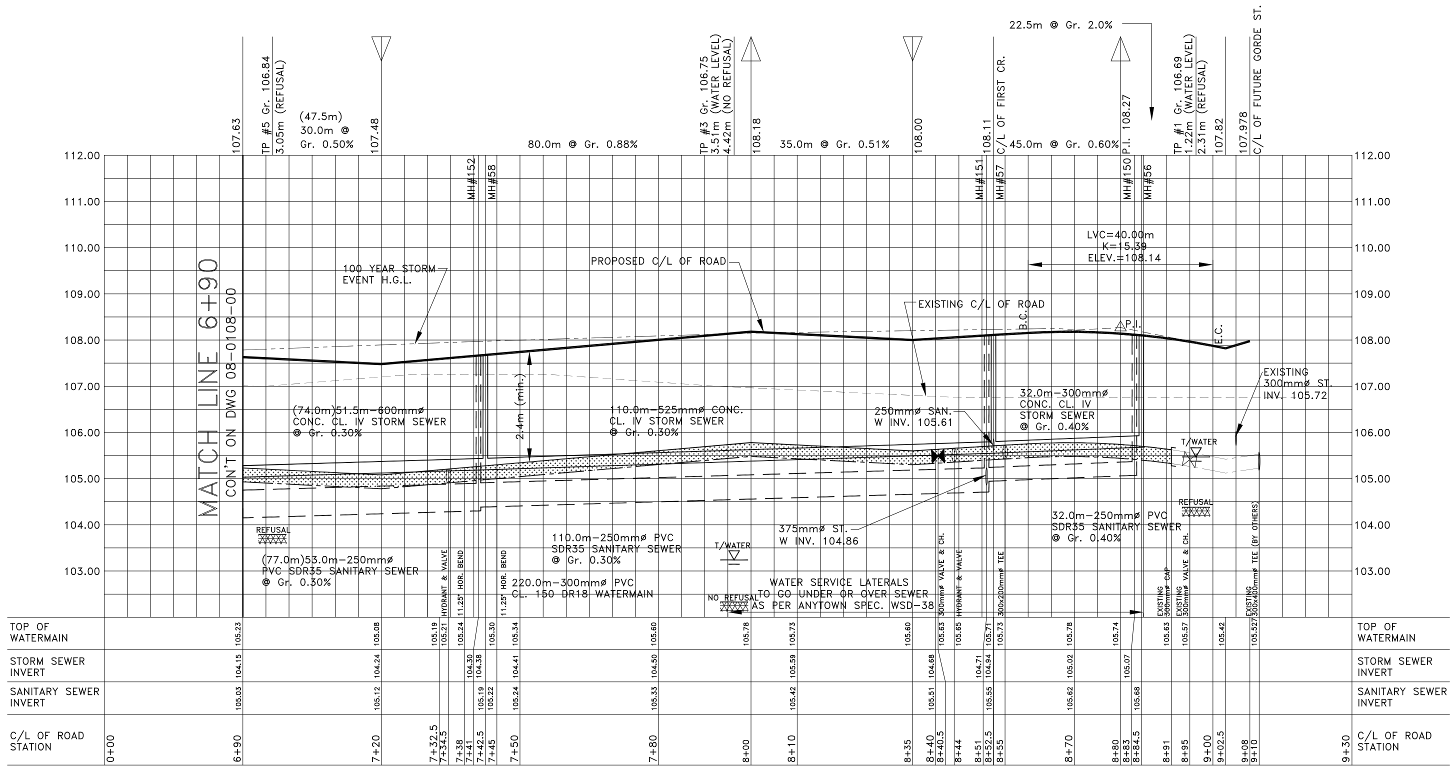
ACME DEVELOPMENT INC.
ACME ANYTOWN SUBDIVISION
THE CITY OF ANYTOWN

TITLE

SITE SERVICING PLAN

PROJECT No.		Your Project No.	FILE No.	0811220108-SS1.dwg
DESIGN	J.C.	27 Aug. 2008	SCALE 1:1,500	REV.
CAD	J.D.	28 Aug. 2008	FIGURE	
CHECK	J.C.	29 Aug. 2008	08-0108-SS1	
REVIEW	P.M.	30 Aug. 2008		


MATCH LINE 6+90
CON'T ON DWG 08-0108-00
THIRD DRIVE
FIRST CR.
GORDE STREET
(ROAD ALLOWANCE BETWEEN CONCESSIONS 10 & 11)
FUTURE
CB TOP 106.35
INV. 105.15
46.0m–250mmø PVC
CB LEAD @ 0.50%
(min.)
HYD. FLANGE
ELEV. 107.69
HYD. FLANGE
ELEV. 108.15
(77.0m)53.0m–250mmø SANITARY
32.0m–250mmø SANITARY
300mmø WATERMAIN
110.0m–250mmø SANITARY
110.0m–525mmø STORM
(74.0m)51.5m–600mmø STORM
32.0m–300mmø
STORM
41.0m–250mmø PVC
CB LEAD @ 0.50%
(min.)
CB TOP 108.27
INV. 107.07
CB TOP 107.68
INV. 106.48
MH#58
MH#152
MH#57
MH#151
MH#56
MH#150
R=16.0m
R=27.5m
R=12.0m
20.0m
11.00m
CONNECTION TO 300mmø
WATERMAIN STUB BY
ANYTOWN PERSONAL.
LOCATION, EXCAVATION,
AND BACKFILL BY
CONTRACTOR
EXISTING
400mmø WATERMAIN
EXISTING WATERMAIN
ELEV. 106.02


MATCH LINE 6+90
CON'T ON DWG 08-0108-00
TP #5 Gr. 106.84
3.05m (REFUSAL)
(47.5m)
30.0m @
Gr. 0.50%
80.0m @ Gr. 0.88%
TP #3 Gr. 106.75
3.51m (WATER LEVEL)
4.42m (NO REFUSAL)
35.0m @ Gr. 0.51%
45.0m @ Gr. 0.60%
22.5m @ Gr. 2.0%
TP #1 Gr. 106.69
1.22m (WATER LEVEL)
2.31m (REFUSAL)
C/L OF FIRST CR.
C/L OF FUTURE GORDE ST.
100 YEAR STORM
EVENT H.G.L.
PROPOSED C/L OF ROAD
EXISTING C/L OF ROAD
LVC=40.00m
K=15.39
ELEV.=108.14
(74.0m)51.5m–600mmø
CONC. CL. IV STORM SEWER
@ Gr. 0.30%
110.0m–525mmø CONC.
CL. IV STORM SEWER
@ Gr. 0.30%
250mmø SAN.
W INV. 105.61
32.0m–300mmø
CONC. CL. IV
STORM SEWER
@ Gr. 0.40%
EXISTING
300mmø ST.
INV. 105.72
2.4m (min.)
(77.0m)53.0m–250mmø
PVC SDR35 SANITARY SEWER
@ Gr. 0.30%
110.0m–250mmø PVC
SDR35 SANITARY SEWER
@ Gr. 0.30%
375mmø ST.
W INV. 104.86
32.0m–250mmø PVC
SDR35 SANITARY SEWER
@ Gr. 0.40%
220.0m–300mmø PVC
CL. 150 DR18 WATERMAIN
WATER SERVICE LATERALS
TO GO UNDER OR OVER SEWER
AS PER ANYTOWN SPEC. WSD–38
REFUSAL
NO REFUSAL
T/WATER
TOP OF WATERMAIN
STORM SEWER INVERT
SANITARY SEWER INVERT
C/L OF ROAD STATION

NOTES

1: CONTRACTOR TO EXCAVATE AND VERIFY THE ELEVATIONS OF EXISTING STORM, SANITARY, AND WATER STUBS PRIOR TO INSTALLATION OF PROPOSED STORM SEWER, SANITARY SEWER AND WATERMAIN.

2: ALL PROPOSED STREET CATCH BASINS ON THE WATERMAIN SIDE OF STREET SHALL BE INSULATED AS PER ANYTOWN DETAIL WSD–23.

3: ALL WATERMAINS & APPURTENANCES SHALL HAVE CATHODIC PROTECTION IN ACCORDANCE WITH ANYTOWN SPECIFICATIONS WSM–9, AND WSD–40.

4: ALL REAR YARD CATCH BASIN LEADS ARE TO BE 250mmø PVC DR35 AT 0.50% (min.) GRADE. STREET CATCH BASIN LEADS ARE TO BE 200mmø.

5: WHERE SEWERS AND WATERMAINS CROSS, 0.5m OF CLEAR VERTICAL SEPARATION SHALL BE MAINTAINED AS PER WSD–25 (typ.).

SCALE: 1:50 VERTICAL — METRES

SCALE: 1:500 HORIZONTAL — METRES

NOTE: 1:500 SCALE ON ORIGINAL 'D' SIZE DRAWING

FOR MOE APPROVAL ONLY

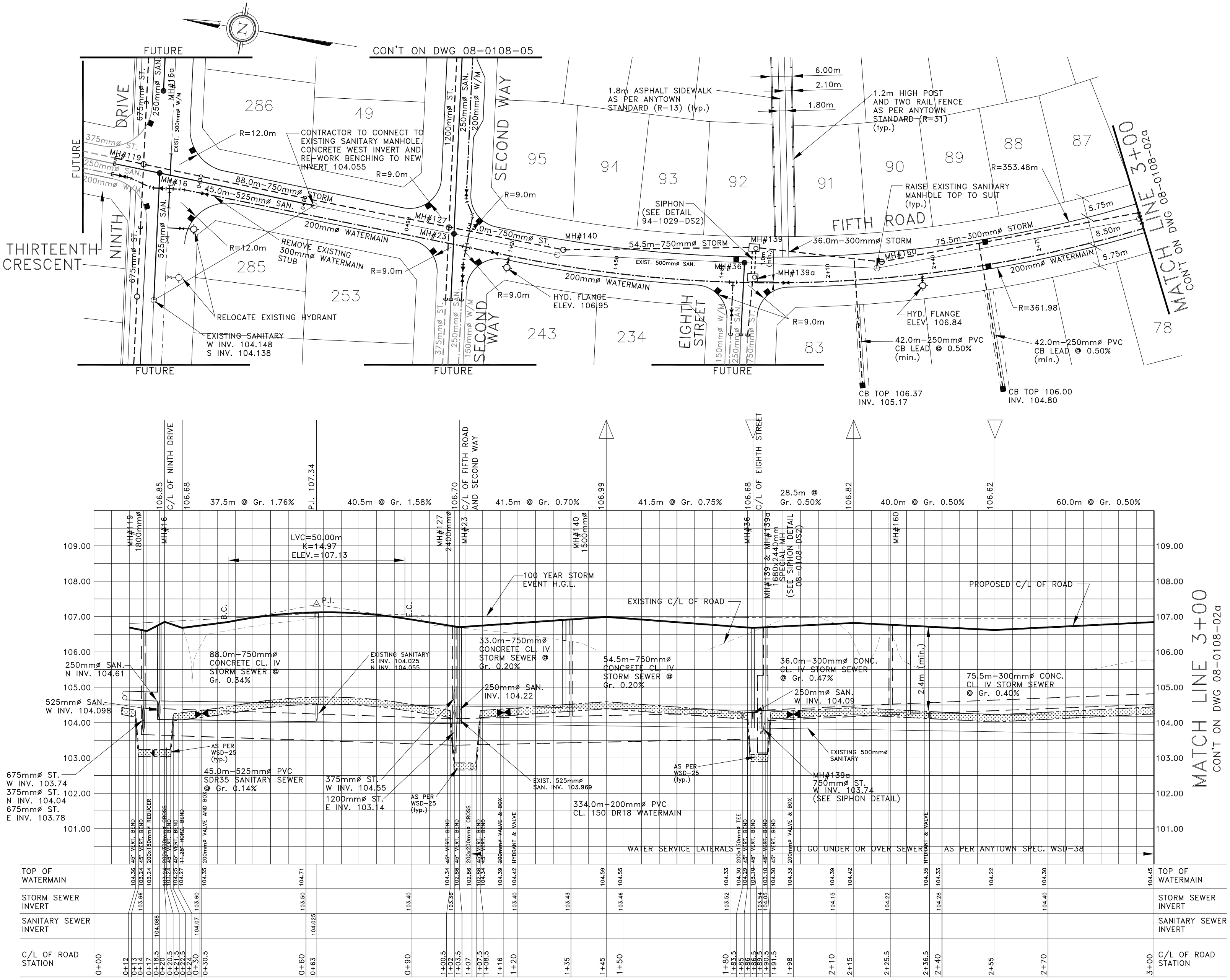
REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

APPROVED — PLACE STAMP OF LICENCED PROFESSIONAL ENGINEER HERE | APPROVED | APPROVED

PROJECT
ACME DEVELOPMENT INC.
ACME ANYTOWN SUBDIVISION
THE CITY OF ANYTOWN

TITLE
THIRD DRIVE
STA. 6+90 to STA. 9+17
(typical sample)

PROJECT No.	Your Project No.		FILE No.	0811220108-P01.dwg
DESIGN	J.C.	27 Aug. 2008	SCALE	AS SHOWN REV.
CAD	J.D.	28 Aug. 2008	FIGURE	
CHECK	J.C.	29 Aug. 2008		08-0108-01
REVIEW	P.M.	30 Aug. 2008		


FUTURE
CON'T ON DWG 08-0108-05
NINTH DRIVE
THIRTEENTH CRESCENT
SECOND WAY
EIGHTH STREET
FIFTH ROAD
286
49
95
94
93
92
91
90
89
88
87
285
253
243
234
83
78
R=12.0m
R=9.0m
CONTRACTOR TO CONNECT TO EXISTING SANITARY MANHOLE. CONCRETE WEST INVERT AND RE-WORK BENCHING TO NEW INVERT 104.055
1.8m ASPHALT SIDEWALK AS PER ANYTOWN STANDARD (R-13) (typ.)
6.00m
2.10m
1.80m
1.2m HIGH POST AND TWO RAIL FENCE AS PER ANYTOWN STANDARD (R-31) (typ.)
R=353.48m
RAISE EXISTING SANITARY MANHOLE TOP TO SUIT (typ.)
SIPHON (SEE DETAIL 94-1029-DS2)
88.0m-750mmø STORM
45.0m-525mmø SAN.
200mmø WATERMAIN
REMOVE EXISTING 300mmø WATERMAIN STUB
33.0m-750mmø ST.
54.5m-750mmø STORM
36.0m-300mmø STORM
75.5m-300mmø STORM
200mmø WATERMAIN
5.75m
8.50m
5.75m
MATCH LINE 3+00 CON'T ON DWG 08-0108-02a
RELOCATE EXISTING HYDRANT
EXISTING SANITARY W INV. 104.148 S INV. 104.138
HYD. FLANGE ELEV. 106.95
HYD. FLANGE ELEV. 106.84
R=361.98
42.0m-250mmø PVC CB LEAD @ 0.50% (min.)
CB TOP 106.37 INV. 105.17
CB TOP 106.00 INV. 104.80
MH#119
MH#16
MH#127
MH#23
MH#140
MH#36
MH#139
MH#139a
MH#160
37.5m @ Gr. 1.76%
40.5m @ Gr. 1.58%
41.5m @ Gr. 0.70%
41.5m @ Gr. 0.75%
28.5m @ Gr. 0.50%
40.0m @ Gr. 0.50%
60.0m @ Gr. 0.50%
LVC=50.00m K=14.97 ELEV.=107.13
100 YEAR STORM EVENT H.G.L.
EXISTING C/L OF ROAD
PROPOSED C/L OF ROAD
88.0m-750mmø CONCRETE CL. IV STORM SEWER @ Gr. 0.34%
33.0m-750mmø CONCRETE CL. IV STORM SEWER @ Gr. 0.20%
54.5m-750mmø CONCRETE CL. IV STORM SEWER @ Gr. 0.20%
36.0m-300mmø CONC. CL. IV STORM SEWER @ Gr. 0.47%
75.5m-300mmø CONC. CL. IV STORM SEWER @ Gr. 0.40%
45.0m-525mmø PVC SDR35 SANITARY SEWER @ Gr. 0.14%
334.0m-200mmø PVC CL. 150 DR18 WATERMAIN
250mmø SAN. N INV. 104.61
525mmø SAN. W INV. 104.098
675mmø ST. W INV. 103.74
375mmø ST. N INV. 104.04
675mmø ST. E INV. 103.78
375mmø ST. W INV. 104.55
1200mmø ST. E INV. 103.14
250mmø SAN. INV. 104.22
250mmø SAN. W INV. 104.09
MH#139a 750mmø ST. W INV. 103.74 (SEE SIPHON DETAIL)
WATER SERVICE LATERALS TO GO UNDER OR OVER SEWERS AS PER ANYTOWN SPEC. WSD-38
TOP OF WATERMAIN
STORM SEWER INVERT
SANITARY SEWER INVERT
C/L OF ROAD STATION

NOTES

1: CONTRACTOR TO EXCAVATE AND VERIFY THE ELEVATIONS OF EXISTING STORM, SANITARY, AND WATER STUBS PRIOR TO INSTALLATION OF PROPOSED STORM SEWER, SANITARY SEWER AND WATERMAIN.

2: ALL PROPOSED STREET CATCH BASINS ON THE WATERMAIN SIDE OF STREET SHALL BE INSULATED AS PER ANYTOWN DETAIL WSD-23.

3: ALL WATERMAINS & APPURTENANCES SHALL HAVE CATHODIC PROTECTION IN ACCORDANCE WITH ANYTOWN SPECIFICATIONS WSM-9, AND WSD-40.

4: ALL REAR YARD CATCH BASIN LEADS ARE TO BE 250mmø PVC DR35 AT 0.50% (min.) GRADE. STREET CATCH BASIN LEADS ARE TO BE 200mmø.

5: WHERE SEWERS AND WATERMAINS CROSS, 0.5m OF CLEAR VERTICAL SEPARATION SHALL BE MAINTAINED AS PER WSD-25 (typ.).

SCALE: 1:50 VERTICAL — METRES

SCALE: 1:500 HORIZONTAL — METRES

NOTE: 1:500 SCALE ON ORIGINAL 'D' SIZE DRAWING

FOR MOE APPROVAL ONLY

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

APPROVED | APPROVED | APPROVED

PLACE STAMP OF LICENCED PROFESSIONAL ENGINEER HERE

PROJECT

ACME DEVELOPMENT INC.
ACME ANYTOWN SUBDIVISION
THE CITY OF ANYTOWN

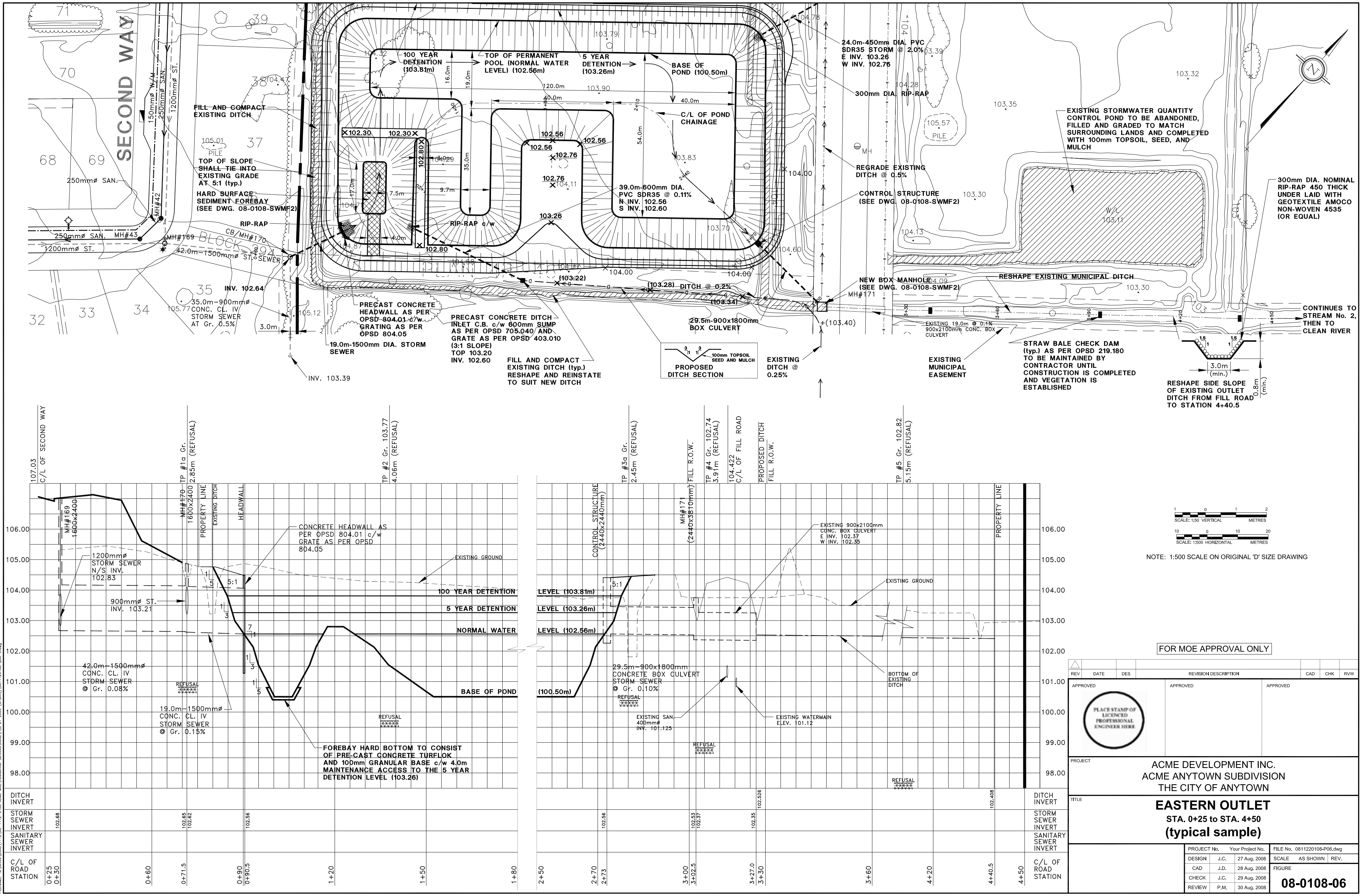
TITLE

FIFTH ROAD

STA. 0+30 to STA. 3+00

(typical sample)

PROJECT No.	Your Project No.	FILE No. 0811220108-p02.dwg	
DESIGN J.C.	27 Aug. 2008	SCALE AS SHOWN	REV.
CAD J.D.	28 Aug. 2008	FIGURE	
CHECK J.C.	29 Aug. 2008		
REVIEW P.M.	30 Aug. 2008	08-0108-02	


SECOND WAY
100 YEAR DETENTION (103.81m)
TOP OF PERMANENT POOL (NORMAL WATER LEVEL) (102.56m)
5 YEAR DETENTION (103.26m)
BASE OF POND (100.50m)
24.0m-450mm DIA. PVC SDR35 STORM @ 2.0% E INV. 103.26 W INV. 102.76
300mm DIA. RIP-RAP
FILL AND COMPACT EXISTING DITCH
C/L OF POND CHAINAGE
EXISTING STORMWATER QUANTITY CONTROL POND TO BE ABANDONED, FILLED AND GRADED TO MATCH SURROUNDING LANDS AND COMPLETED WITH 100mm TOPSOIL, SEED, AND MULCH
TOP OF SLOPE SHALL TIE INTO EXISTING GRADE AT 5:1 (typ.)
HARD SURFACE SEDIMENT FOREBAY (SEE DWG. 08-0108-SWMF2)
REGRADE EXISTING DITCH @ 0.5%
39.0m-600mm DIA. PVC SDR35 @ 0.11% N INV. 102.56 S INV. 102.60
CONTROL STRUCTURE (SEE DWG. 08-0108-SWMF2)
RIP-RAP
RIP-RAP c/w
300mm DIA. NOMINAL RIP-RAP 450 THICK UNDER LAID WITH GEOTEXTILE AMOCO NON-WOVEN 4535 (OR EQUAL)
250mmø SAN.
1200mmø ST.
42.0m-1500mmø ST.
INV. 102.64
35.0m-900mmø CONC. CL. IV STORM SEWER AT Gr. 0.5%
PRECAST CONCRETE HEADWALL AS PER OPSD 804.01 c/w GRATING AS PER OPSD 804.05
PRECAST CONCRETE DITCH INLET C.B. c/w 600mm SUMP AS PER OPSD 705.040 AND GRATE AS PER OPSD 403.010 (3:1 SLOPE) TOP 103.20 INV. 102.60
NEW BOX MANHOLE (SEE DWG. 08-0108-SWMF2)
RESHAPE EXISTING MUNICIPAL DITCH
DITCH @ 0.2%
29.5m-900x1800mm BOX CULVERT
CONTINUES TO STREAM No. 2, THEN TO CLEAN RIVER
19.0m-1500mm DIA. STORM SEWER
INV. 103.39
FILL AND COMPACT EXISTING DITCH (typ.) RESHAPE AND REINSTATE TO SUIT NEW DITCH
100mm TOPSOIL SEED AND MULCH
PROPOSED DITCH SECTION
EXISTING DITCH @ 0.25%
EXISTING MUNICIPAL EASEMENT
STRAW BALE CHECK DAM (typ.) AS PER OPSD 219.180 TO BE MAINTAINED BY CONTRACTOR UNTIL CONSTRUCTION IS COMPLETED AND VEGETATION IS ESTABLISHED
RESHAPE SIDE SLOPE OF EXISTING OUTLET DITCH FROM FILL ROAD TO STATION 4+40.5
3.0m (min.)
0.8m (min.)
C/L OF SECOND WAY
TP #1a Gr. 2.85m (REFUSAL)
TP #2 Gr. 103.77 4.06m (REFUSAL)
TP #3a Gr. 2.45m (REFUSAL)
TP #4 Gr. 102.74 3.91m (REFUSAL)
C/L OF FILL ROAD
PROPOSED DITCH FILL R.O.W.
TP #5 Gr. 102.82 5.15m (REFUSAL)
PROPERTY LINE
CONTROL STRUCTURE (2440x2440mm)
MH#171 (2440x3810mm)
CONCRETE HEADWALL AS PER OPSD 804.01 c/w GRATE AS PER OPSD 804.05
EXISTING GROUND
100 YEAR DETENTION LEVEL (103.81m)
5 YEAR DETENTION LEVEL (103.26m)
NORMAL WATER LEVEL (102.56m)
BASE OF POND (100.50m)
1200mmø STORM SEWER N/S INV. 102.83
900mmø ST. INV. 103.21
42.0m-1500mmø CONC. CL. IV STORM SEWER @ Gr. 0.08%
19.0m-1500mmø CONC. CL. IV STORM SEWER @ Gr. 0.15%
FOREBAY HARD BOTTOM TO CONSIST OF PRE-CAST CONCRETE TURFLOK AND 100mm GRANULAR BASE c/w 4.0m MAINTENANCE ACCESS TO THE 5 YEAR DETENTION LEVEL (103.26)
29.5m-900x1800mm CONCRETE BOX CULVERT STORM SEWER @ Gr. 0.10%
EXISTING SAN. 400mmø INV. 101.125
EXISTING WATERMAIN ELEV. 101.12
EXISTING 900x2100mm CONC. BOX CULVERT E INV. 102.37 W INV. 102.35
BOTTOM OF EXISTING DITCH
REFUSAL
DITCH INVERT
STORM SEWER INVERT
SANITARY SEWER INVERT
C/L OF ROAD STATION
SCALE: 1:50 VERTICAL METRES
SCALE: 1:500 HORIZONTAL METRES
NOTE: 1:500 SCALE ON ORIGINAL 'D' SIZE DRAWING
FOR MOE APPROVAL ONLY
PLACE STAMP OF LICENCED PROFESSIONAL ENGINEER HERE

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

APPROVED | APPROVED | APPROVED

PROJECT

ACME DEVELOPMENT INC.
ACME ANYTOWN SUBDIVISION
THE CITY OF ANYTOWN

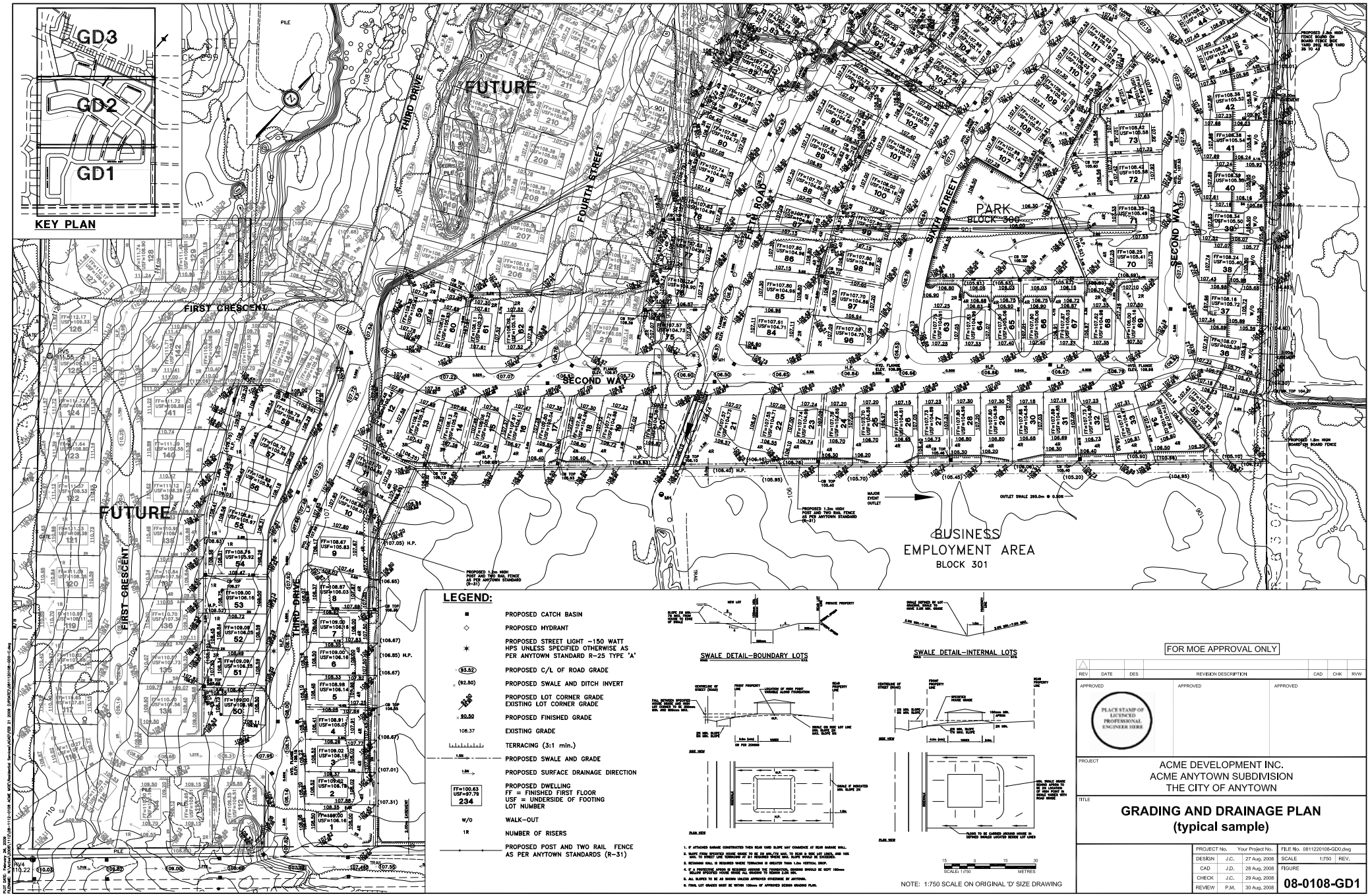
TITLE

EASTERN OUTLET

STA. 0+25 to STA. 4+50

(typical sample)

PROJECT No.	Your Project No.		FILE No. 0811220108-P06.dwg	
DESIGN	J.C.	27 Aug. 2008	SCALE AS SHOWN	REV.
CAD	J.D.	28 Aug. 2008	FIGURE	
CHECK	J.C.	29 Aug. 2008		
REVIEW	P.M.	30 Aug. 2008	08-0108-06	



FOR MOE APPROVAL ONLY

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

APPROVED

PLACE STAMP OF LICENCED PROFESSIONAL ENGINEER HERE

APPROVED

APPROVED

PROJECT

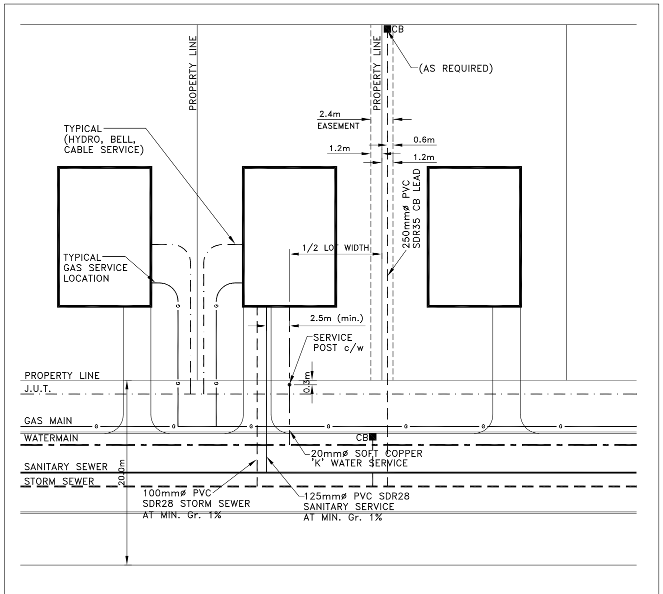
ACME DEVELOPMENT INC.
ACME ANYTOWN SUBDIVISION
THE CITY OF ANYTOWN

TITLE

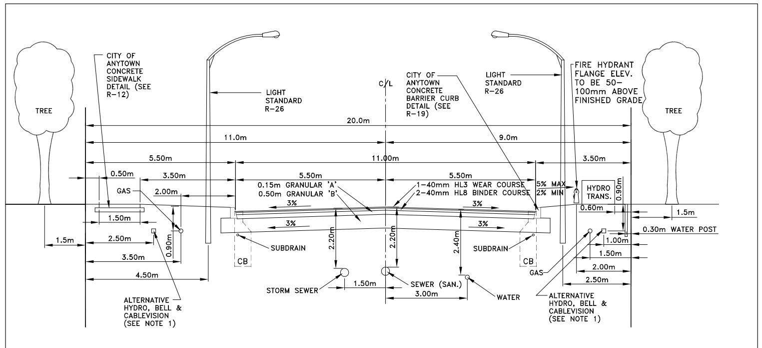
GRADING AND DRAINAGE PLAN (typical sample)

PROJECT No.	Your Project No.		FILE No. 0811220108-GD0.dwg		
DESIGN	J.C.	27 Aug. 2008	SCALE	1:750	REV.
CAD	J.D.	28 Aug. 2008	FIGURE		
CHECK	J.C.	29 Aug. 2008	08-0108-GD1		
REVIEW	P.M.	30 Aug. 2008			

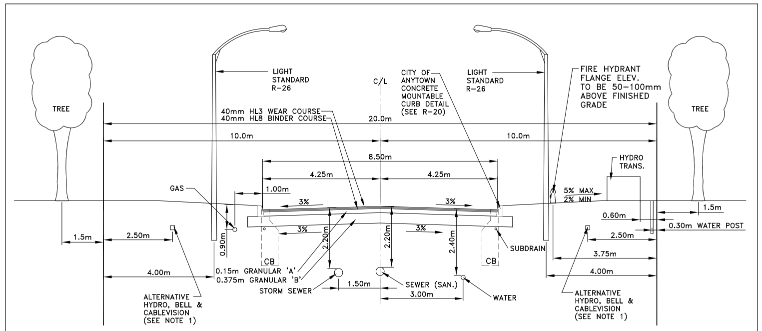
PLOT DATE: February 26, 2009
FILENAME: N:\Work\2008\1110\08-1110-0108 ACME MDP\Residential Services\ADACVER 21 2009 (UPDATE)\08111010810-GD1-0.dwg


PROPERTY LINE
CB
(AS REQUIRED)
TYPICAL (HYDRO, BELL, CABLE SERVICE)
2.4m EASEMENT
1.2m
0.6m
1.2m
250mmø PVC SDR35 CB LEAD
TYPICAL GAS SERVICE LOCATION
1/2 LOT WIDTH
2.5m (min.)
SERVICE POST c/w
PROPERTY LINE
J.U.T.
GAS MAIN
WATERMAIN
20mmø SOFT COPPER 'K' WATER SERVICE
SANITARY SEWER
STORM SEWER
100mmø PVC SDR28 STORM SEWER AT MIN. Gr. 1%
125mmø PVC SDR28 SANITARY SERVICE AT MIN. Gr. 1%
20.0m

SERVICE DETAIL
SCALE: N.T.S.


TREE
CITY OF ANYTOWN CONCRETE SIDEWALK DETAIL (SEE R-12)
LIGHT STANDARD R-26
C/L
CITY OF ANYTOWN CONCRETE BARRIER CURB DETAIL (SEE R-19)
FIRE HYDRANT FLANGE ELEV. TO BE 50-100mm ABOVE FINISHED GRADE
20.0m
11.0m
9.0m
5.50m
11.00m
3.50m
0.15m GRANULAR 'A'
0.50m GRANULAR 'B'
1-40mm HL3 WEAR COURSE
2-40mm HL8 BINDER COURSE
5% MAX. 2% MIN.
HYDRO TRANS.
SUBDRAIN
STORM SEWER
SEWER (SAN.)
WATER
GAS
ALTERNATIVE HYDRO, BELL & CABLEVISION (SEE NOTE 1)
0.30m WATER POST

TYPICAL MODIFIED COLLECTOR ROAD CROSS SECTION
SCALE: N.T.S.
(NINTH DRIVE)


TREE
LIGHT STANDARD R-26
C/L
CITY OF ANYTOWN CONCRETE MOUNTABLE CURB DETAIL (SEE R-20)
FIRE HYDRANT FLANGE ELEV. TO BE 50-100mm ABOVE FINISHED GRADE
40mm HL3 WEAR COURSE
40mm HL8 BINDER COURSE
20.0m
10.0m
8.50m
4.25m
HYDRO TRANS.
GAS
5% MAX. 2% MIN.
0.15m GRANULAR 'A'
0.375m GRANULAR 'B'
STORM SEWER
SEWER (SAN.)
WATER
SUBDRAIN
ALTERNATIVE HYDRO, BELL & CABLEVISION (SEE NOTE 1)
0.30m WATER POST

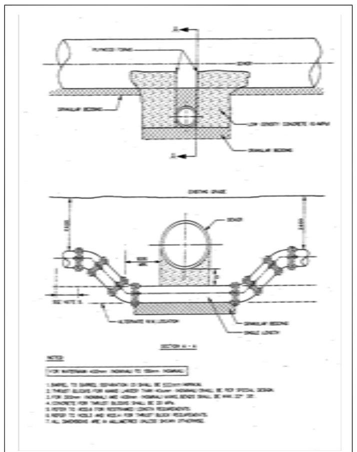
TYPICAL LOCAL ROAD CROSS SECTION
SCALE: N.T.S.

NOTES (ROAD CROSS SECTION)

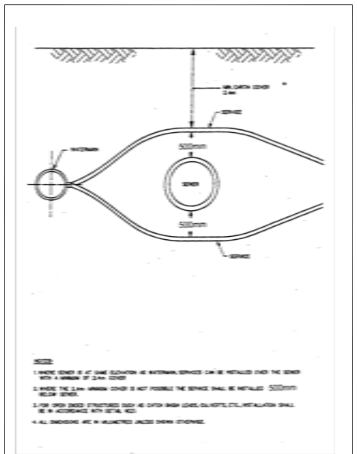
1. MIN. COVER
   BELL AND CABLEVISION – 500mm
   HYDRO – 1.0m
2. SUB-EXCAVATE SOFT AREAS IN SUBBASE AND FILL WITH APPROVED NATIVE MATERIAL OR GRAN. 'B' COMPACTED IN 150mm LAYERS.
3. ALL MATERIALS TO BE SUPPLIED AND PLACED AS PER O.P.S. SPECIFICATIONS.
4. DEPTH OF GRANULAR 'B' TO BE INCREASED AS REQUIRED BY SOIL CONDITIONS AND TO EXTEND 600mm BEHIND F.O.C.
5. BOULEVARDS TO BE SODDED.
6. ON BUS ROUTES THE PAVEMENT AND GRANULAR DEPTHS SHALL BE EQUIVALENT TO THOSE SPECIFIED FOR RESIDENTIAL COLLECTOR LANES.
7. TACK COAT REQUIRED ON OVERLAYING OF BINDER COARSE UNLESS PRIOR APPROVAL IN WRITING.
8. GEOTECHNICAL CONSULTING ENGINEER TO PROVIDE A DESIGN FOR DEPTH OF GRAN. B-TYPE II IN GRANULAR SOILS. DEPTH OF GRAN. B-TYPE II MAY BE REDUCED TO A MIN. OF 300mm, AND IN OTHER SOILS MIN. DEPTH MAY BE INCREASED BY THE RECOMMENDATION OF THE GEOTECHNICAL ENGINEER.

30 0 30 60
SCALE: METRES

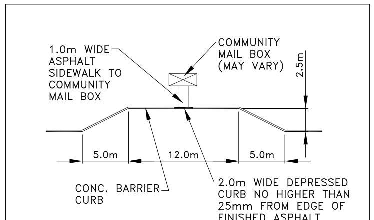
NOTE: 1:1,500 SCALE ON ORIGINAL 'D' SIZE DRAWING



WATERMAIN CROSSING BELOW SEWER
DATE: MAY 2001
REV. DATE: JAN. 2003
DWG No.: WSD-25



SERVICE INSTALLATION AT SEWER CROSSING
DATE: MAY 2001
REV. DATE: NONE
DWG No.: WSD-38



CANADA POST LAY-BY DETAIL
SCALE: N.T.S.

FOR MOE APPROVAL ONLY

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

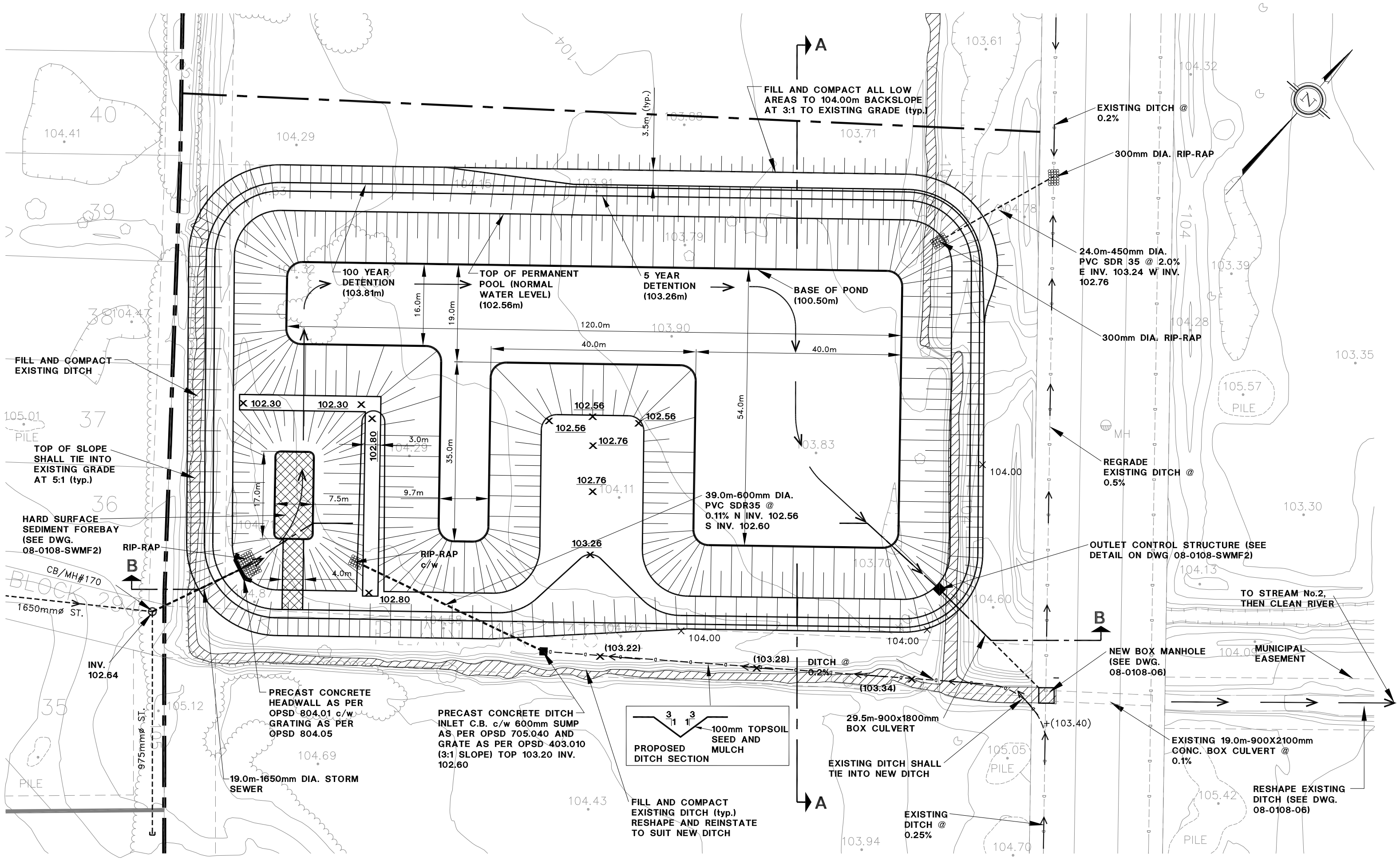
APPROVED — PLACE STAMP OF LICENCED PROFESSIONAL ENGINEER HERE | APPROVED | APPROVED

PROJECT
ACME DEVELOPMENT INC.
ACME ANYTOWN SUBDIVISION
THE CITY OF ANYTOWN

TITLE
DETAIL SHEET

PROJECT No.	Your Project No.		FILE No. 0811220108-DS1.dwg
DESIGN	J.C.	27 Aug. 2008	SCALE AS SHOWN REV.
CAD	J.D.	28 Aug. 2008	FIGURE
CHECK	J.C.	29 Aug. 2008	
REVIEW	P.M.	30 Aug. 2008	08-0108-DS1

PLOT DATE: February 26, 2009


FILL AND COMPACT ALL LOW AREAS TO 104.00m BACKSLOPE AT 3:1 TO EXISTING GRADE (typ.)
EXISTING DITCH @ 0.2%
300mm DIA. RIP-RAP
24.0m-450mm DIA. PVC SDR 35 @ 2.0% E INV. 103.24 W INV. 102.76
300mm DIA. RIP-RAP
100 YEAR DETENTION (103.81m)
TOP OF PERMANENT POOL (NORMAL WATER LEVEL) (102.56m)
5 YEAR DETENTION (103.26m)
BASE OF POND (100.50m)
FILL AND COMPACT EXISTING DITCH
TOP OF SLOPE SHALL TIE INTO EXISTING GRADE AT 5:1 (typ.)
HARD SURFACE SEDIMENT FOREBAY (SEE DWG. 08-0108-SWMF2)
RIP-RAP
RIP-RAP c/w
39.0m-600mm DIA. PVC SDR35 @ 0.11% N INV. 102.56 S INV. 102.60
REGRADE EXISTING DITCH @ 0.5%
OUTLET CONTROL STRUCTURE (SEE DETAIL ON DWG 08-0108-SWMF2)
TO STREAM No.2, THEN CLEAN RIVER
MUNICIPAL EASEMENT
NEW BOX MANHOLE (SEE DWG. 08-0108-06)
INV. 102.64
PRECAST CONCRETE HEADWALL AS PER OPSD 804.01 c/w GRATING AS PER OPSD 804.05
PRECAST CONCRETE DITCH INLET C.B. c/w 600mm SUMP AS PER OPSD 705.040 AND GRATE AS PER OPSD 403.010 (3:1 SLOPE) TOP 103.20 INV. 102.60
19.0m-1650mm DIA. STORM SEWER
PROPOSED DITCH SECTION
100mm TOPSOIL SEED AND MULCH
FILL AND COMPACT EXISTING DITCH (typ.) RESHAPE AND REINSTATE TO SUIT NEW DITCH
29.5m-900x1800mm BOX CULVERT
EXISTING DITCH SHALL TIE INTO NEW DITCH
EXISTING DITCH @ 0.25%
EXISTING 19.0m-900X2100mm CONC. BOX CULVERT @ 0.1%
RESHAPE EXISTING DITCH (SEE DWG. 08-0108-06)
DITCH @ 0.2%
CB/MH#170
1650mmø ST.
975mmø ST.
BLOCK 29
A
A
B
B

PLAN VIEW

SCALE: 1:400

LEGEND

× (103.87) APPROXIMATE EXISTING DITCH INVERT

MH EXISTING MANHOLE

NOTES:

1. ALL DISTURBED AREAS TO BE REINSTATED TO EQUAL OR BETTER CONDITION.
2. ALL SIDE SLOPES TO BE COMPLETED WITH 100mm TOPSOIL SEED AND MULCH.
3. PLANTING SHALL BE IN ACCORDANCE WITH M.O.E. GUIDELINES. PLANTING WILL INCLUDE SUBMERGENT, FRINGE, AND UPLAND SPECIES.
4. RIP RAP SHALL BE 300mmø (min.) c/w GEOTEXTILE AMOCO NON-WOVEN 4535 OR EQUAL AS PER OPSD 810.01.

SCALE: 1:400 METRES

NOTE: 1:400 SCALE ON ORIGINAL 'D' SIZE DRAWING

FOR MOE APPROVAL ONLY

REFER TO SWMF2 FOR FACILITY DETAILS AND SECTIONS.

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

APPROVED — PLACE STAMP OF LICENCED PROFESSIONAL ENGINEER HERE | APPROVED | APPROVED

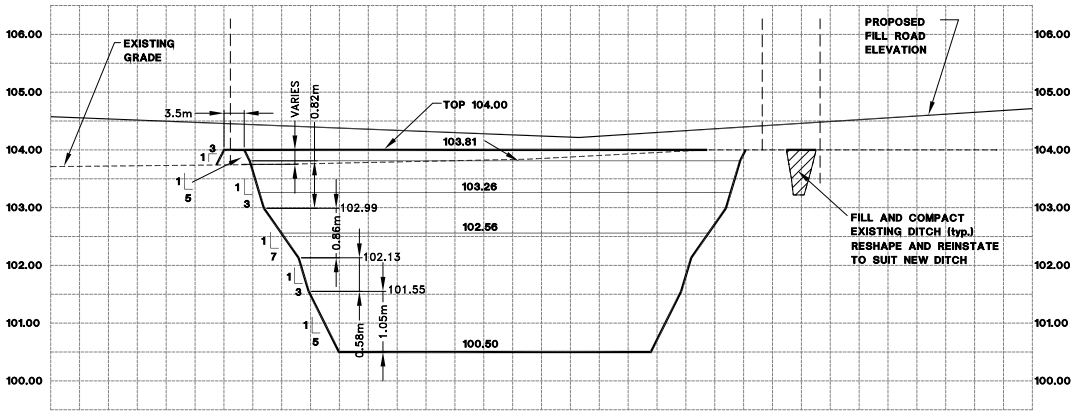
PROJECT

ACME DEVELOPMENT INC.
ACME ANYTOWN SUBDIVISION
THE CITY OF ANYTOWN

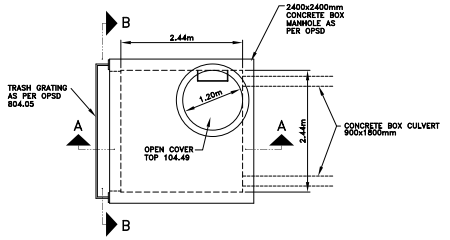
TITLE

STORMWATER MANAGEMENT FACILITY PLAN

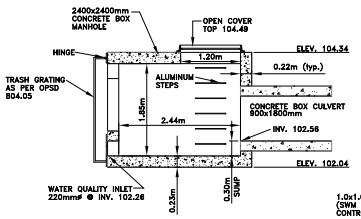
PROJECT No.	Your Project No.	FILE No. 0811220108-SWMF1.dwg	
DESIGN	J.C.	27 Aug. 2008	SCALE AS SHOWN REV.
CAD	J.D.	28 Aug. 2008	FIGURE
CHECK	J.C.	29 Aug. 2008	08-0108-SWMF1
REVIEW	P.M.	30 Aug. 2008	



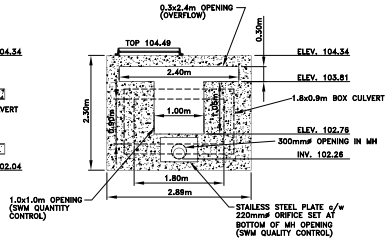
SECTION A-A
SCALE: HOR. 1:400
VERT. 1:40



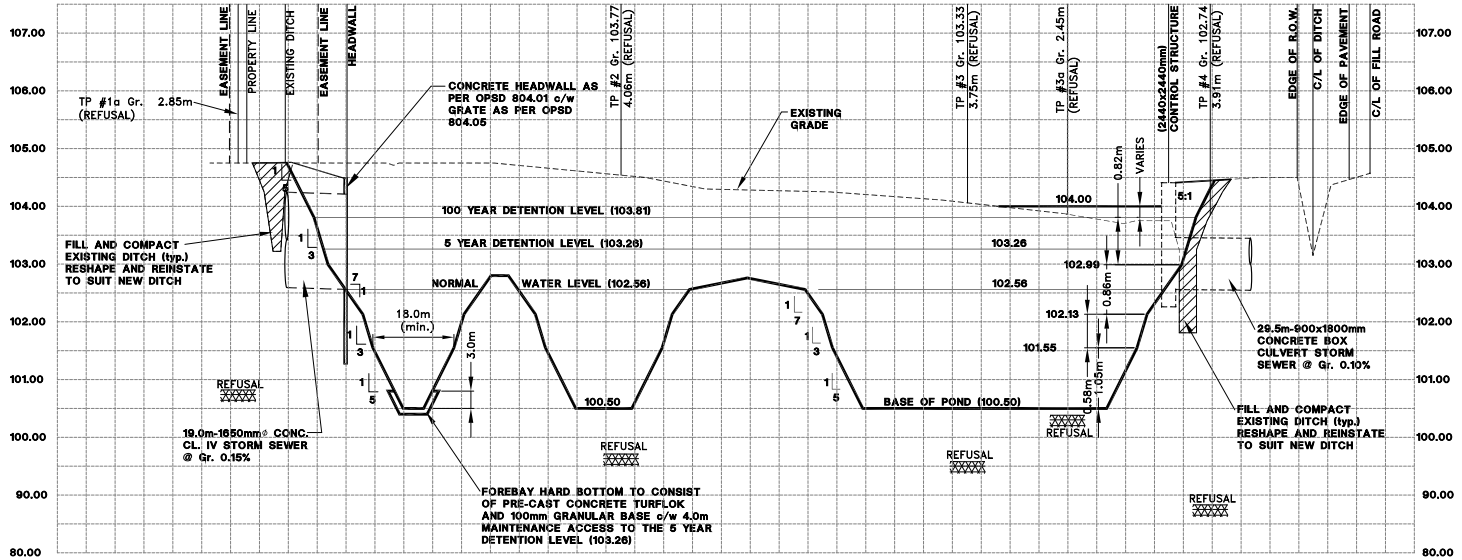
PLAN VIEW
OUTLET CONTROL STRUCTURE DETAIL
(2400x2400mm)



SECTION A-A
OUTLET CONTROL STRUCTURE DETAIL
(2400x2400mm)



VIEW B
OUTLET CONTROL STRUCTURE DETAIL
(2400x2400mm)



SECTION B-B
SCALE: HOR. 1:400
VERT. 1:40

NOTE: 1:400 SCALE ON ORIGINAL 'D' SIZE DRAWING

FOR MOE APPROVAL ONLY

REV	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

APPROVED — PLACE STAMP OF LICENCED PROFESSIONAL ENGINEER HERE | APPROVED | APPROVED

PROJECT
ACME DEVELOPMENT INC.
ACME ANYTOWN SUBDIVISION
THE CITY OF ANYTOWN

TITLE
STORMWATER MANAGEMENT FACILITY DETAILS

PROJECT No.	Your Project No.	FILE No. 0811220108-SWMF2.dwg	
DESIGN	J.C.	27 Aug, 2008	SCALE AS SHOWN REV.
CAD	J.D.	28 Aug, 2008	FIGURE
CHECK	J.C.	29 Aug, 2008	08-0108-SWMF2
REVIEW	P.M.	30 Aug, 2008	